Knowledge, attitude and practice among dental practitioners with regard to overcoming the barriers created by personal protective equipment in the COVID-19 era and delivering effective dental treatment: A questionnaire-based cross-sectional study

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Abstract

Background. In the wake of the coronavirus disease 2019 (COVID-19) pandemic, dental professionals are at high risk of contracting the virus owing to their close proximity to patients. Using personal protective equipment (PPE) is necessary to avoid being infected as well as to avoid being the source of infection. Apart from physical limitations, also communication and work efficiency are affected by the barriers created by PPE.

Objectives. This study was conducted to assess knowledge, attitude and practice regarding the challenges faced by dental practitioners in India due to the use of PPE as well as to discuss the ways of overcoming these barriers by dentists.

Material and methods. A cross-sectional study was conducted during a period of 1 month. A Google Forms questionnaire was sent out; it included 12 questions regarding the use of PPE, changes in the diet and the work routine, the side effects of PPE, effects on communication and work efficiency, and the patients' attitude toward PPE. The obtained data was subjected to the statistical analysis with the use of the IBM SPSS Statistics for Windows software, v. 26.0. For all statistical tests, $p < 0.05$ was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study of 80%.

Results. A total of 390 dentists completed the questionnaire. The study revealed that 85% of the respondents agreed that wearing PPE affected their work efficiency and 89% experienced difficulty in communication. The majority of the participants experienced side effects, like profuse sweating, breathlessness, headaches, and skin irritation.

Conclusions. It was proven that the current use of PPE not only makes communication harder, but also elevates anxiety among patients. Dentists have adapted themselves by switching to other means of communication, such as sending instructions by means of text messages/telemedicine, as well as taking breaks between patients, switching to a healthier diet, and exercising regularly, thus helping to minimize the adverse effects of PPE.

Keywords: dentists, dental anxiety, COVID-19, personal protective equipment (PPE), side effects of PPE

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has tremendously affected the dental profession. Dentists are at high risk of contracting and transmitting severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that causes COVID-19, alongside paramedics, nurses and other health care workers. The virus is mainly present in the nasopharyngeal and salivary secretions of infected patients, and is spread primarily through respiratory droplets, aerosols and fomites. Dental treatment requires from the dentist to be in close proximity to the patient's mouth and throat, which makes the dental personnel highly exposed to the virus, and contributes to the transmission of the virus to other staff members and patients. Many dental procedures, such as using headpieces and ultrasonic instruments, generate aerosols, increasing the likelihood of spreading the virus, which makes dentistry one of the most high-risk professions.[1] COVID-19 has not only increased the fear of aerosol contamination during dental treatment, but also caused the fear of close contacts.[2] The use of disinfectants and personal protective equipment (PPE) remains imperative for maintaining proper working conditions and preventing further transmission. Personal protective equipment minimizes exposure to the contaminated body fluids, reducing the risk of infection.[3] It creates a physical barrier between the pathogenic organisms and the operator, thus preventing any droplets from settling on the operator's skin. However, dentists are facing a new set of challenges, both physical and mental, from wearing PPE as they adapt to provide quality dental care in the COVID-19 era.

Along with the physical limitations created by PPE, communication is also affected due to the already increased levels of anxiety and stress created during this health care crisis.[4] Understanding the dentist becomes significantly more difficult for patients and the dental assistant due to the added layers of PPE along with the surrounding noise of the compressor, suction, fans, and other equipment. Consequently, it is hard for the patient to follow the operator's instructions during treatment. Personal protective equipment, which includes gloves, gowns, shoe covers, head covers, masks, respirators, face shields, and goggles, hides facial expressions, the main tool for displaying emotions. Smiling, one of the easiest and most pleasing ways to connect with other person, is no longer an option. Masks muffle voices, making it more difficult to catch every word and infer the emotion associated with it. In addition to these barriers, there are several side effects associated with the use of PPE, resulting in physical and emotional exhaustion, which in turn affects the dentist's work efficiency.

This survey focuses on the assessment of the common concerns of practicing dentists in the COVID-19 era and was designed to study the overall effects of PPE on a dental setup.

The aim of the study was to assess the common concerns among dentists related to their practice in the COVID-19 era, to assess their use of PPE on a daily basis, to determine if the pandemic has in any way changed their work routine, and to assess any side effects and difficulty in communication created by the use of PPE.

Material and methods

Study settings and participants

This questionnaire-based cross-sectional study was conducted over a period of 1 month between February 1 and March 5, 2021. The participants consisted of practicing dentists from various parts of India with varying experience, age, sex, and specialty. The study participants were approached by the principal investigator.

Sample size

The sample size was estimated using the OpenEpi software, v. 3.01 (https://www.openepi.com/Menu/OE_Menu.htm), and the 'sample size for frequency in a population' formula. A p-value <0.05 was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study of 80%; a total sample size of 390 was derived.

Data collection

A structured, self-explanatory questionnaire was created in English on the Google Forms platform. It consisted of a brief introduction to the study, followed by 2 sections. Section I collected the demographic data, and section II consisted of 12 open- and closed-ended questions regarding the participants' knowledge, attitude and practice with regard to the use of PPE, changes in their diet and work routine, the side effects of PPE, and effects on communication and work efficiency (Table 1). The study participants were approached by the principal investigator via personal connections and the Internet/e-based technologies (e.g., online platforms and e-mail). A pilot study was initially conducted with 10 participants. According to their responses and feedback, the following changes were made:

– the questions were divided into 2 sections – section I consisted of questions related to the sociodemographic data, while section II consisted of questions related to the use of PPE in a dental setup;
– multiple option checkboxes were added wherever necessary.

The questionnaire was then sent to the study participants and their responses were kept confidential. Timely reminders were sent as well. Participation was completely voluntary and all the participants could opt out of the study by not completing the questionnaire.

Table 1. Questionnaire used in the study

	No.	Questions	Answer options
Section I: Questions related to the sociodemographic data	1.	Name	
	2.	Age [years]	a) 20–30 b) 31–40 c) 41–50 d) above 50
	3.	Sex	a) male b) female
	4.	Specialty	a) general dentistry b) endodontics c) oral medicine and radiology d) oral pathology e) oral surgery f) orthodontics g) pediatric dentistry h) periodontics i) prosthodontics j) public health dentistry
	5.	Experience [years]	a) <5 b) 5–10 c) 10–15 d) 15–20 e) >20
	6.	Type of practice	a) institution/college b) private clinic c) both
Section II: Questions related to the use of PPE in a dental setup	1.	What components of PPE do you use most commonly?	a) gown b) mask/respirator c) shoe cover d) head cover e) eye protection f) face shield g) all of the above
	2.	According to you, which is the most effective mask?	a) N95 mask b) FFP2 mask c) surgical mask d) respirator
	2a.	What type of mask do you use?	a) N95 mask b) FFP2 mask c) surgical mask d) respirator
	3.	How many times do you remove your PPE during a normal workday?	a) never b) 2–3 times c) 4–5 times d) after each patient
	4.	Do you take lunch/ water breaks?	a) yes b) no
Section II: Questions related to the use of PPE in a dental setup	5.	As compared to pre-COVID-19 times, have you changed your food intake pattern?	a) yes b) no
	6.	As compared to pre-COVID-19 times, how have you changed your work routine to accommodate to the use of PPE?	a) reducing working hours b) completing all patients at one go, and then changing PPE c) taking breaks and changing PPE d) reducing the number of workdays e) any other
	7.	Has PPE affected your work efficiency?	a) yes b) no
	7a.	If yes, how?	a) more time being spent per patient b) impaired vision c) feeling of exhaustion/fatigue d) any other
	8.	What side effects do you experience due to the use of PPE?	a) headaches b) breathlessness c) skin irritation/oily skin d) profuse sweating e) hoarse voice f) dry throat g) blocked/stuffy nose h) dry mouth i) any other
	9.	Do you feel there is difficulty in communication due to the use of PPE?	a) yes b) no
	9a.	If yes, amongst whom?	a) between the dentist and the patient b) between the dentist and the dental assistant
	9b.	How do you overcome this?	
	10.	Do you think the patient is more anxious seeing you in PPE?	a) yes b) no c) don't know
	10a.	If yes, what do you do to alleviate the patient's anxiety?	
	11..	How do you explain the treatment plan to the patient?	a) on the dental chair while wearing PPE b) at the front desk after doffing PPE c) by clicking pictures and explaining them to the patient over WhatsApp d) any other
	12.	How do you give post-operative instructions and medications to the patient?	a) on the dental chair while wearing PPE b) at the front desk, by the receptionist c) over phone/WhatsApp d) any other

PPE – personal protective equipment; COVID-19 – coronavirus disease 2019.

Statistical analysis

The data was compiled in a Microsoft Office Excel spreadsheet (v. 2019; Microsoft Corporation, Redmond, USA). The data was subjected to the statistical analysis with the use of the IBM SPSS Statistics for Windows software, v. 26.0 (IBM Corp., Armonk, USA). Descriptive statistics like number and percentage (n (%)) were used for categorical data. Numerical data was expressed as mean and standard deviation ($M \pm SD$). The comparison of frequencies for the categories of variables between the groups was made using the χ^2 test. For all statistical tests, $p < 0.05$ was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study of 80%.

Results

This survey had a sample size of 390 dentists who completed the questionnaire (201 general dentists and 189 specialists). More than half of the participants (n = 273; 70.00%) were between 20 and 30 years of age, with 269 (68.97%) having worked less than 5 years. Among all the participants, 158 (40.51%) were male and 232 (59.49%) were female. A total of 174 (44.62%) respondents were practicing at an institution/college and 104 (26.67%) were practicing at a private clinic. The distribution of specialists was as follows: 45 prosthodontists; 33 orthodontists; 23 pedodontists; 19 endodontists; 18 oral pathologists; 15 oral surgeons; 15 periodontists; 14 radiologists, and 7 public health dentists. These details are presented in Table 2.

Table 2. Demographic details of the participants (N = 390)

Demographic details		n (%)
Age [years]	20–30	273 (70.00)
	31–40	67 (17.18)
	41–50	26 (6.67)
	above 50	24 (6.15)
Sex	male	158 (40.51)
	female	232 (59.49)
Experience [years]	<5	269 (68.97)
	5–10	49 (12.56)
	10–15	30 (7.69)
	15–20	10 (2.56)
	>20	32 (8.21)
Specialty	general dentistry	201 (51.54)
	prosthodontics	45 (11.53)
	orthodontics	33 (8.46)
	pediatric dentistry	23 (5.90)
	endodontics	19 (4.87)
	oral pathology	18 (4.61)
	oral surgery	15 (3.85)
	periodontics	15 (3.85)
	oral medicine and radiology	14 (3.59)
	public health dentistry	7 (1.79)
Type of practice	institution/college	174 (44.62)
	private clinic	104 (26.67)
	both	112 (28.71)

n – number.

Approximately ⅓ of the participants (n = 142; 36.41%) used a gown, a mask/respirator, a head cover/hood, and a face shield as part of their PPE on a daily basis. Among the respondents, 283 (72.56%) agreed that N95 masks were the most effective ones, and 224 (57.44%) used an N95 mask regularly. It was found that 163 (41.79%) of the participants removed their PPE 2–3 times a day, while 109 (27.95%) never removed their PPE during a normal workday.

As per the responses recorded, 133 (34.10%) participants did not take any lunch/water breaks between patients. As compared to pre-COVID times, 117 (30.00%) respondents changed their food intake pattern. The survey found that 40 (10.26%) dentists decided to have healthier foods, such as freshly prepared home-cooked meals, including vegetables, fruits and eggs (i.e., a fibrous, proteinaceous, vitamin-rich diet). There were 30 (7.69%) who answered that they skipped meals or had delayed meals, whereas 28 (7.18%) maintained a strict diet routine and hygiene, and avoided in-between snacking.

According to 331 (84.87%) participants, wearing PPE had affected their work efficiency, while 59 (15.13%) responded that it had not. Just over ⅓ of the participants (n = 137; 35.13%) had to spend more time per patient, had their vision impaired and felt exhaustion. It was found that 89% of the respondents had difficulty in communication due to the use of PPE, while 11% stated that they had no difficulty. Among the participants, 38% responded to the open-ended question on how they overcome this difficulty in communication. For 21.54% of the dentists, this involved repeating loudly, 9.74% preferred other means of communication (like providing instructions via text messages or calls, writing on a piece of paper, or using a microphone with a small speaker), 4.62% preferred communicating before/after the procedure, and 2.56% removed the mask or the face shield for a moment. Among the respondents, 28% agreed that the patient seemed more anxious upon seeing the dentist in PPE. When asked how they alleviate this anxiety, 41 (10.51%) stated that they had a conversation and reassured the patient, 23 (5.90%) explained the importance of wearing PPE to the patient and 14 (3.59%) lightened the mood with a joke. The majority of the participants (n = 231; 59.23%) responded that they explained the treatment plan and gave post-operative instructions to the patient on the dental chair while wearing their PPE, 84 (21.54%) provided this information at the front desk

after doffing their PPE, and some used a mobile phone/WhatsApp. These results are presented in Table 3.

Highly statistically significant differences were observed in the response rates for certain categories ($p < 0.010$), with higher frequencies for the response 'female' (Table 4), for the participants falling within the age group of 20–30 years (Table 5) and for the participants working in the institutional/dental hospital type of practice (Table 6). When the response rates were compared with regard to the number of years of experience, there was a higher frequency for the participants with less than 5 years of experience ($p < 0.010$) (Table 7). When comparing specialties, there was a statistically higher response rate from the participants practicing as general dentists ($p < 0.010$) (Table 8).

Figure 1 presents the responses regarding side effects: 287 participants experienced profuse sweating; 203 participants experienced breathlessness; 168 participants suffered from headaches; 145 participants had a dry mouth; 113 participants experienced a dry throat; 111 respondents experienced skin irritation or oily skin; 83 participants had a blocked/stuffy nose; and 28 participants experienced a hoarse voice.

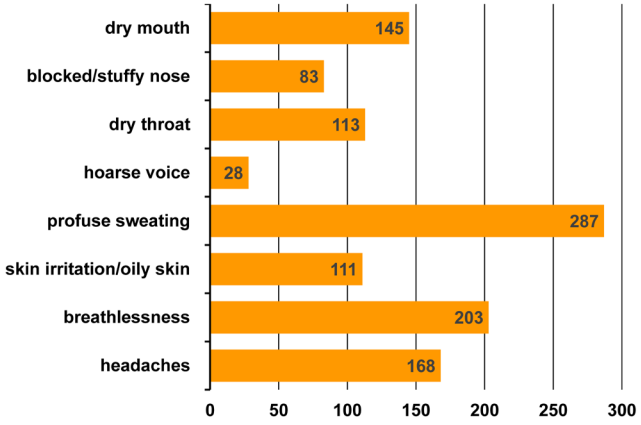

Fig. 1. Side effects of personal protective equipment (PPE)

Table 3. Overall responses to the questionnaire

Question	Response	*n* (%)
What components of PPE do you use most commonly?	gown, mask/respirator, head cover/hood, face shield	142 (36.41)
	gown, mask/respirator, face shield	100 (25.64)
	all of the above	102 (26.15)
According to you, which is the most effective mask?	N95 mask	283 (72.56)
	respirator	85 (21.79)
What type of mask do you use?	N95 mask	224 (57.44)
	N95 mask, surgical mask	98 (25.13)
How many times do you remove your PPE during a normal workday?	never	109 (27.95)
	2–3 times	163 (41.79)
	after each patient	98 (25.13)
As compared to pre-COVID-19 times, how have you changed your food intake pattern?	healthier foods, like freshly prepared home-cooked meals, including vegetables, fruits, eggs (a fibrous, proteinaceous, vitamin-rich diet)	40 (10.26)
	prefer having food at home and not at the clinic	19 (4.87)
	skipping meals or having delayed meals	30 (7.69)
	maintaining strict routine and hygiene, avoiding in-between snacking	28 (7.18)
As compared to pre-COVID-19 times, how have you changed your work routine to accommodate to the use of PPE?	reducing working hours	118 (30.26)
	completing all patients at one go, and then changing PPE	127 (32.56)
	taking breaks and changing PPE	105 (26.9)2
How has PPE affected your work efficiency?	more time being spent per patient, impaired vision, feeling of exhaustion/fatigue	137 (35.13)
Amongst whom do you feel difficulty in communication the most?	between the dentist and the patient, between the dentist and the dental assistant	208 (53.33)
How do you overcome this?	repeating loudly	84 (21.54)
	other means of communication	38 (9.74)
	removing the mask or the face shield for a moment	10 (2.56)
What do you do to alleviate the patient's anxiety?	having a conversation and reassuring the patient	41 (10.51)
	explaining the importance of wearing PPE	23 (5.90)
	lightening the mood by cracking a joke	14 (3.59)
How do you explain the treatment plan and provide post-operative instructions to the patient?	on the dental chair while wearing PPE	231 (59.23)
	at the front desk after doffing PPE	84 (21.54)

Table 4. Comparison of the responses according to sex

Question	Response	Sex		Total	*p*-value
		female	male		
What components of PPE do you use most commonly?	gown, mask/respirator, head cover/hood, face shield	86	56	142	<0.010*
	all of the above	60	42	102	
According to you, which is the most effective mask?	N95 mask	183	100	283	<0.010*
	respirator	42	43	85	
What type of mask do you use?	N95 mask	133	91	224	<0.010*
	N95 mask, surgical mask	66	32	98	
How many times do you remove your PPE during a normal workday?	never	65	44	109	<0.010*
	2–3 times	107	56	163	
As compared to pre-COVID-19 times, how have you changed your work routine to accommodate to the use of PPE?	reducing working hours	71	47	118	<0.010*
	completing all patients at one go, and then changing PPE	68	59	127	
	taking breaks and changing PPE	68	37	105	
How has PPE affected your work efficiency?	more time being spent per patient, impaired vision, feeling of exhaustion/fatigue	98	39	137	<0.010*
How do you overcome difficulty in communication?	repeating loudly	46	38	84	<0.010*
	other means of communication	20	18	38	
What do you do to alleviate the patient's anxiety?	having a conversation and reassuring the patient	28	13	41	<0.010*
	explaining the importance of wearing PPE	9	14	23	
How do you explain the treatment plan and provide post-operative instructions to the patient?	on the dental chair while wearing PPE	127	104	231	<0.010*
	at the front desk after doffing PPE	54	30	84	

Data presented as number (*n*). * statistically significant.

Table 5. Comparison of the responses according to age

Question	Response	Age [years]				Total	*p*-value
		20–30	31–40	41–50	above 50		
What components of PPE do you use most commonly?	gown, mask/respirator, head cover/hood, face shield	105	22	4	11	142	<0.010*
	all of the above	57	23	18	4	102	
According to you, which is the most effective mask?	N95 mask	205	49	18	11	283	<0.010*
	respirator	51	17	8	9	85	
What type of mask do you use?	N95 mask	133	56	24	11	224	<0.010*
	N95 mask, surgical mask	89	1	0	8	98	
How many times do you remove your PPE during a normal workday?	never	72	25	8	4	109	<0.010*
	2–3 times	112	21	19	11	163	
As compared to pre-COVID-19 times, how have you changed your work routine to accommodate to the use of PPE?	reducing working hours	67	30	16	5	118	<0.010*
	completing all patients at one go, and then changing PPE	94	12	9	12	127	
	taking breaks and changing PPE	84	14	2	5	105	
How has PPE affected your work efficiency?	more time being spent per patient, impaired vision, feeling of exhaustion/fatigue	113	16	6	2	137	<0.010*
How do you overcome difficulty in communication?	repeating loudly	49	22	4	9	84	<0.010*
	other means of communication	21	8	8	1	38	
What do you do to alleviate the patient's anxiety?	having a conversation and reassuring the patient	34	5	2	0	41	<0.010*
	explaining the importance of wearing PPE	11	8	4	0	23	
How do you explain the treatment plan and provide post-operative instructions to the patient?	on the dental chair while wearing PPE	155	43	16	17	231	<0.010*
	at the front desk after doffing PPE	64	14	2	4	84	

Data presented as number (*n*). * statistically significant.

Table 6. Comparison of the responses according to type of practice

Question	Response	Type of practice			Total	*p*-value
		institution/ college	private clinic	both		
What components of PPE do you use most commonly?	gown, mask/respirator, head cover/hood, face shield	75	29	38	142	<0.010*
	all of the above	38	26	38	102	
According to you, which is the most effective mask?	N95 mask	141	63	79	283	<0.010*
	respirator	22	34	29	85	
What type of mask do you use?	N95 mask	87	59	78	224	<0.010*
	N95 mask, surgical mask	51	35	12	98	
How many times do you remove your PPE during a normal workday?	never	31	33	45	109	<0.010*
	2–3 times	74	57	32	163	
As compared to pre-COVID-19 times, how have you changed your work routine to accommodate to the use of PPE?	reducing working hours	50	30	38	118	<0.010*
	completing all patients at one go, and then changing PPE	42	53	32	127	
	taking breaks and changing PPE	64	15	26	105	
How has PPE affected your work efficiency?	more time being spent per patient, impaired vision, feeling of exhaustion/fatigue	83	28	26	137	<0.010*
How do you overcome difficulty in communication?	repeating loudly	21	32	31	84	<0.010*
	other means of communication	14	12	12	38	
What do you do to alleviate the patient's anxiety?	having a conversation and reassuring the patient	20	9	12	41	<0.010*
	explaining the importance of wearing PPE	7	6	10	23	
How do you explain the treatment plan and provide post-operative instructions to the patient?	on the dental chair while wearing PPE	86	82	63	231	<0.010*
	at the front desk after doffing PPE	42	16	26	84	

Data presented as number (*n*). * statistically significant.

Table 7. Comparison of the responses according to the number of years of experience

Question	Response	Experience [years]					Total	*p*-value
		<5	5–10	10–15	15–20	>20		
What components of PPE do you use most commonly?	gown, mask/respirator, head cover/hood, face shield	101	21	8	1	11	142	<0.010*
	all of the above	57	15	10	8	12	102	
According to you, which is the most effective mask?	N95 mask	205	31	22	6	19	283	<0.010*
	respirator	47	19	6	4	9	85	
What type of mask do you use?	N95 mask	139	30	28	8	19	224	<0.010*
	N95 mask, surgical mask	82	8	0	0	8	98	
How many times do you remove your PPE during a normal workday?	never	68	23	6	2	10	109	<0.010*
	2–3 times	116	14	16	4	13	163	
As compared to pre-COVID-19 times, how have you changed your work routine to accommodate to the use of PPE?	reducing working hours	69	18	16	8	7	118	<0.010*
	completing all patients at one go, and then changing PPE	88	16	2	2	19	127	
	taking breaks and changing PPE	84	10	6	0	5	105	
How has PPE affected your work efficiency?	more time being spent per patient, impaired vision, feeling of exhaustion/fatigue	105	22	6	0	4	137	<0.010*
How do you overcome difficulty in communication?	repeating loudly	41	17	15	0	11	84	<0.010*
	other means of communication	24	3	6	0	5	38	
What do you do to alleviate the patient's anxiety?	having a conversation and reassuring the patient	34	2	3	0	2	41	<0.010*
	explaining the importance of wearing PPE	13	2	6	2	0	23	
How do you explain the treatment plan and provide post-operative instructions to the patient?	on the dental chair while wearing PPE	157	27	16	8	23	231	<0.010*
	at the front desk after doffing PPE	60	14	6	0	4	84	

Data presented as number (*n*). * statistically significant.

Table 8. Comparison of the responses according to the specialty

Question	Response	Specialty										Total	*p*-value
		general dentistry	prosthodontics	orthodontics	pediatric dentistry	endodontics	oral pathology	oral surgery	periodontics	oral medicine and radiology	public health dentistry		
What components of PPE do you use most commonly?	gown, mask/respirator, head cover/hood, face shield	68	15	9	21	6	6	4	8	1	4	142	<0.010*
What type of mask do you use?	N95 mask	99	37	14	18	12	12	6	12	10	4	224	<0.010*
As compared to pre-COVID-19 times, how have you changed your work routine to accommodate to the use of PPE?	reducing working hours	59	20	0	10	4	4	4	8	4	5	118	<0.010*
How has PPE affected your work efficiency?	more time being spent per patient, impaired vision, feeling of exhaustion/fatigue	81	14	12	8	0	4	4	6	6	2	137	<0.010*
How do you overcome difficulty in communication?	repeating loudly	35	2	9	12	3	0	4	10	6	3	84	<0.010*
	other means of communication	16	3	6	3	0	1	0	0	9	0	38	
What do you do to alleviate the patient's anxiety?	having a conversation and reassuring the patient	28	0	0	5	0	0	3	5	0	0	41	<0.010*
How do you explain the treatment plan and provide post-operative instructions to the patient?	on the dental chair while wearing PPE	126	25	21	13	1	16	4	3	10	2	231	<0.010*

Data presented as number (*n*). * statistically significant.

Discussion

This study assessed the common concerns among dentists about practicing during the COVID-19 pandemic as well as the overall effects of the pandemic on dental setups. Apart from its influence on clinical practice, the pandemic has also affected dental schools and dental university hospitals, resulting in partial or full closure. This in turn has had a negative impact on dental training and education, despite online teaching protocols.[5] Personal protective equipment prevents exposure to an infectious agent or a body fluid by creating a barrier between the potential infectious material and the health care worker.[6] It includes gloves, gowns, shoe covers, head covers, masks, respirators, face shields, and goggles. The responses indicate that 36% of the participants used gowns, masks/respirators, head covers/hoods, and face shields. It was found that 57% of the participants used an N95 mask, and 25% used both an N95 mask and a surgical mask for additional protection (Table 3). There are 2 issues to be considered with regard to the efficacy of a face mask – the filtration of the material and the fit of the design.[7] A surgical mask is a loose-fitting, disposable mask and does not provide complete protection. An N95/FFP2 respirator is designed to achieve a very close facial fit and very efficient filtration of airborne particles. The edges of the respirator are designed to form a seal around the nose and the mouth. The donning and doffing of PPE is a critical process that requires significant attention to detail. This process, particularly the removal and disposal of the contaminated PPE, is considered a very important step in limiting exposure to pathogens.[1]

When examining the changes introduced by the participants regarding their food intake pattern, 34% of the participants did not take any lunch/water breaks between patients and 33% preferred completing all of the patients for the day, and then removing their PPE. This could lead to ill effects, like dehydration, fatigue, irritability, and constant hunger, which could in turn affect their work. Eating more nutritious, immunity-boosting, vitamin-rich food was preferred by many, especially in this COVID-19 era. Some dentists skipped or delayed their meals because of an ongoing patient or to avoid the inconvenience of removing their PPE. This can prove harmful in the long run by causing serious side effects that include fatigue, skin problems, depression, and weight loss. According to this survey, 85% of the dentists reported that the arduous use of PPE affected their work efficiency. In fact, 35% of the participants said that they spent more time per patient owing to the use of PPE. Some endodontists responded that it took more time to complete a root canal, since their tactile sensation was diminished due to the use of double gloves. According to a survey conducted by Swaminathan et al.,

vision is impaired due to the presence of a face shield, and thus using a microscope has become difficult.[8] In the present study, it was found that the participants had a constant feeling of exhaustion due to the heat and perspiration caused by the use of PPE.

Dental professionals of all ages are experiencing increased levels of physical and emotional discomfort since resuming the routine care. The study found that 43% of the participants reported headaches, which is the 3rd most often reported side effect of implementing the advanced PPE protocols (Fig. 1). This could be a sign of dehydration.[9] To avoid or minimize headaches and dehydration, it is important to drink enough fluids during the day. Profuse sweating was reported by 74% of the respondents and 52% reported breathlessness. Taking short breaks throughout the day that allows one to remove their PPE may help overcome these difficulties. Reduced O_2 in the inspired air, CO_2 retention, rebreathing, and increased temperature, in isolation or combination, during prolonged PPE use could be a cause of physical exhaustion and breathlessness.[10] In the present survey, 28% of the respondents reported skin irritation or oily skin due to the use of face masks. The constant rubbing of the mask against the skin causes micro-tears, allowing easier entry for bacteria and dirt to clog the pores.[11] Exposure duration is considered to be the main risk factor for facial dermatitis, particularly when masks and goggles are worn for over 6 h. Washing hands more than 10 times a day may increase the risk of hand damage.[12]

The study findings support the authors' assumption that there is difficulty in communication due to the use of PPE (as reported by 89% of the participants). With the mouth being completely covered, safety glasses covering the eyebrows and face shields further muffling sound, in addition to the noisy working environment, both patients and the dental staff struggle to comprehend each other (as reported by 53% of the participants). Dentists have adapted themselves to overcome this communication gap. For example, 22% stated that repeating their instructions loudly was effective. However, in addition to frustration or miscommunication, raising one's voice for prolonged periods may lead to issues with voice strain and abuse.[12] A further 10% resorted to other means of communication, such as providing instructions via text messages or calls, writing on a piece of paper, or using a microphone with a small speaker. Non-verbal communication with hand gestures and other movements also proved to be effective.

Generally, when interacting with an unfamiliar face, people tend to focus their attention on the mouth and the eyes, as these are most expressive. For health care workers, it is difficult to convey a feeling of calmness or happiness, as almost 85% of the face is covered with PPE.[13] This can add to the stress and anxiety patients already feel owing to this health care crisis.[14] To alleviate this anxiety, the participants explained the importance of wearing PPE and how it provides safety to both the operator and the patient.[15] Having a conversation and reassuring the patient, or lightening the mood with a joke proved to be helpful. Communication is not just simply talking; the tone of the speech and expressions are important factors that influence it. Not only does the current use of masks and safety glasses make communication difficult, but it also causes digging on the bridge of the nose and the sides of the face, which may cause skin irritation. Prolonged side effects, like dehydration, sweating, fatigue, breathlessness, and headaches could be detrimental in the long run.

The use of PPE has been amplified during the COVID-19 pandemic; however, protection needs to be comfortable, not only to prevent fatigue or physical pain, but also for psychological well-being.[16]

Conclusions

Even though the use of PPE has become more important than ever, the results of this study show that it is a challenge for dentists in a clinical setup. As reported by the participants, there is difficulty in communication due to the added layers and the muffling of sound, and changes in work routines and food intake patterns may cause malnourishment and dehydration. There was a significant decrease in work efficiency owing to the added layers and their side effects. The most frequent side effect of PPE was profuse sweating, while the least experienced was a hoarse voice. All of the dentists faced side effects like dehydration, headaches, sweating, and fatigue, which could be detrimental in the long run.

In order to mitigate these problems, adapting to other means of communication, alleviating the patient's anxiety, taking regular breaks, drinking plenty of water, and having a healthy and balanced diet are essential for dentists in the COVID-19 era.

Ethics approval and consent to participate

The study was approved by the institutional Research Ethics Committee (No. of approval 144/IRB/YMTDC2021) after obtaining approval from 2 reviewers. The respondents participated in the study voluntarily.

Data availability

All data generated and/or analyzed during this study is included in this published article.

Consent for publication

Not applicable.

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