






Assessing the Attitude and Practices of Dental Surgeons Towards Periodontal Health After the COVID-19 Outbreak

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ABSTRACT

Objective: To assess the orientation of dental practitioners in understanding the probable relationship between COVID-19 and periodontal infection and the measures they took toward periodontal health during the pandemic. **Material and Methods:** A cross-sectional questionnaire-based survey was conducted, including registered dentists in Moradabad. The questionnaire provided was a self-administered, closed-ended questionnaire with 26 questions, shared via an online survey link utilizing Google Forms. The data collected was tabulated and statistically evaluated. **Results:** The participants implemented many preventive measures in their daily lives against COVID-19, such as hand washing, frequent hand sanitization, face shields, mouth masks, social distancing not, being in overcrowded places, using HEPA filters and different combinations of protective measures against COVID-19. 82.23% of participants learned from the official websites of organizations like the Ministries of Health, WHO, and professional organizations about COVID-19. **Conclusion:** Most participants endorsed oral hygiene measures and the use of mouthwashes by their patients, yet a significant number of dental surgeons needed to be made aware of a probable correlation between COVID-19 infection and chronic periodontitis.

Keywords: Knowledge; Periodontitis; Dentists; Coronavirus; COVID-19.

Introduction

The unique coronavirus illness (COVID-19), brought on by the coronavirus (SARS-CoV-2), is currently the most significant public health crisis to hit our planet in the past hundred years. After the prolonged human-to-human transmissions, the outbreak began in Wuhan, China, with animal-to-human transmissions [1]. The latter is supported by the respiratory tract's detectable (angiotensin-converting enzyme) ACE2 cell receptors [2,3].

Periodontal disease is the unspoken disease which has been a pandemic for years. It is influenced by various factors that complicate its pathophysiology by establishing responses to cytokines [4]. A recent study has found that COVID-19 is associated with unfavorable consequences, which may start the cytokine storm, where the elements are similar to the periodontitis cytokine profile [4]. Individuals who need admission to the ICU have manifestations with increased levels of Interleukin-2, Interleukin-7, Interleukin-10, Inducible Protein-10, Granulocyte-Colony Stimulating Factor, Macrophage Inflammatory Proteins-1 A, Monocyte Chemoattractant Protein-1 and Tumour Necrosis Factor-alpha. Individuals with SARS-CoV (severe acute respiratory syndrome coronavirus) and MERS-CoV (middle-east respiratory syndrome coronavirus) also show increased sequence of T-helper (Th) 17 reaction [4]. The SARS-CoV-2 may cause lung infection due to the Th17 cell's inflammatory response in the cytokine storm, which leads to pulmonary edema and tissue damage [4,5]. The inter-relationship seen between COVID-19, periodontal disease, and cytokine relation may build up advice to improve oral hygiene during the COVID-19 pandemic situation as it is also seen that individuals with periodontal disease are at higher risk of getting COVID-associated complications/unfavorable consequences [5].

SARS-CoV-2 has been detected in the saliva of over 90% of infected persons using a viral culture approach, and a susceptible SARS CoV-2 RdRp/Hel test was used to confirm a significant viral load presence in oral fluids (mainly saliva) [6-8]. Moreover, both asymptomatic and symptomatic patients' virus titers in the nose and throat were discovered to be similar [9]. Since SARS-CoV-2 came into light, causing worldwide mayhem, it has been mutating, and different variants have come to light, which may cause a significant inability of healthcare professionals to tackle the challenges facing them ahead.

Studies show that oral health has a significant overall impact on health. Cytokines or other microbial products released in response to oral infections are associated with the progression of systemic diseases and inflammation in distant organs [10-14]. According to several studies, having poor oral health increases the risk of systemic diseases [11,15,16].

Exacerbated lung infection by oral pathogens may be explained by many mechanisms, including aspiration of oral pathogens into the lower respiratory tract, especially in high-risk individuals, modification of mucosal surfaces along the respiratory tract by salivary enzymes, which thereby facilitate colonization by pathogens and secretion of pro-inflammatory cytokines during periodontitis, which can promote adhesion to lung epithelium and lung colonization by respiratory pathogens [17,18]. Therefore, improving oral hygiene may reduce oropharyngeal colonization and the risk of respiratory complications.

SARS-CoV-2 infection causes a systemic inflammatory response because of the release of pro-inflammatory cytokines in large amounts [19]. Nevertheless, the mechanism of virus invasion and the causes of this inflammatory response in SARS-CoV-2 infection are mainly unknown.

Improved oral hygiene and frequent professional oral health care have reduced the progression or occurrence of respiratory diseases, particularly in the elderly population and patients in intensive care units [20]. The group is at higher risk for developing COVID-19-related severe complications.

Individuals with severe medical conditions, poor oral health, and the senior population are at high risk for developing severe illness due to SARS-CoV2 infection. Therefore, improved oral health in individuals of any age group may reduce the morbidity of COVID-19 [21].

The most common transmission route of SARS-COV-2 is direct contact with the coughed and sneezed patient's droplet. Furthermore, the transmission of SARS-CoV-2 from person to person is mainly through oral route. The dental staff has the risk of coronavirus infection due to the specificity of their procedures, such as face-to-face communication, direct contact with saliva, and micro-organism inhalation that may remain in the air for a long time [22].

Therefore, considering this, the present questionnaire-based survey was undertaken on dentists to determine their awareness of the COVID-19 disease.

Material and Methods

Study Design and Sample

A cross-sectional questionnaire was conducted in Moradabad, Uttar Pradesh, India, which included dental practitioners in this region. A total of 243 male and female dentists participated in the survey. The study was blinded, and the dentists' identities were not revealed to the surveyor.

Inclusion Criteria

Dental practitioners who have completed BDS degree; dentists willing to give informed consent for participation in the study; and dentists practicing in private clinics/institutions/hospitals or any other establishment in Moradabad.

The survey did not include dental practitioners without a BDS degree, who were unwilling to give informed consent for the study, who practiced outside of Moradabad, and those who do not work in private clinics or institutions/hospitals.

Sample Size Calculation

$$n = \frac{z^2 \times \hat{p}(1 - \hat{p})}{\epsilon^2}$$

where z is the z score, ϵ is the margin of error, n is the population size, and \hat{p} is the population proportion. Based on the above formula, taking $z=1.96$ at a 7% margin of error, 95% confidence interval, and 50% response distribution, the sample size of the present study was estimated. The questionnaire was pretested for reliability and validity based on the Cohen kappa value of 0.97 and was found to be excellent.

Questionnaire

A self-administered, closed-ended questionnaire comprising 26 questions was sent to registered dentists in Moradabad through an online survey link using Google Forms. Informed consent for their participation was obtained, and confidentiality of responses was assured. The individuals were informed regarding the purpose of the study, and information was collected only from those who gave consent. The survey questionnaire was validated before being circulated. The questionnaire was structured and divided into three sections, i.e., socio-demographic section, assessment of attitude of the dentist, and practice relation section.

Data Analysis

The data for the present study was entered into Microsoft Excel 2007 and analyzed using the SPSS statistical software 22.0 (IBM, Chicago, IL, USA). The descriptive statistics included frequency and percentage. The significance level for the present study was fixed at 5%. The individual questions and their responses were analyzed using the chi-square test.

Ethical Approval

An informed consent was obtained after explaining the aim and objective of the study to the willing participants. The ethical clearance was received from the Institutional Ethical Committee (TMU/TMDCRC/IEC/2020/05), and the study was per the Declaration of Helsinki [23].

Results

A total of 243 dentists participated in the survey, of which 149 were females and 97 were males. Figure 1 shows the dentists' distribution according to their specialization field, with 43.4% accounting for the majority who are general practitioners.

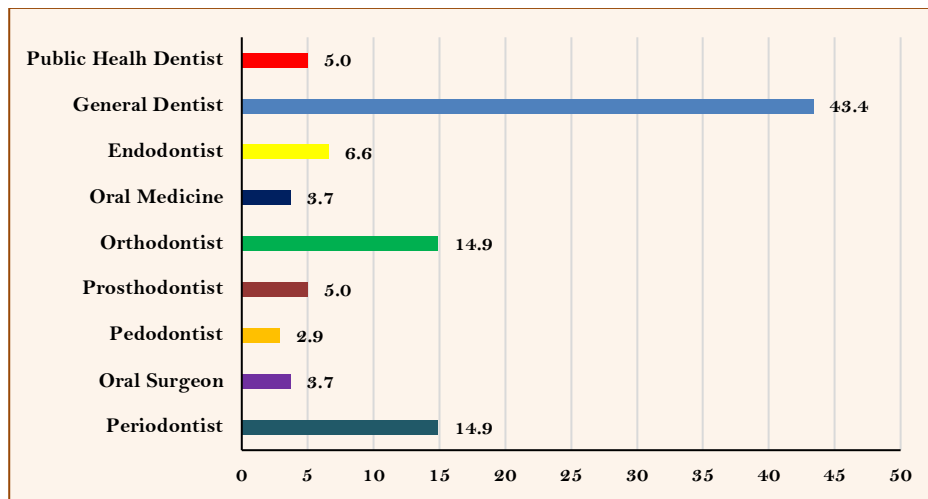


Figure 1. Distribution of participants based on field of specialization.

Table 1 shows the descriptive analysis of the COVID-19 and periodontitis knowledge, awareness, and attitude of the participants, where 0.4% to 3.3% of participants have no or insignificant knowledge about COVID-19; however, 42.6% to 46.3% of participants have moderate to sufficient knowledge. Most participants (69%) believed that infection by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a very likely risk for the dentist, and only 2.9% of participants thought that the risk is unlikely. It can be safely interpreted from Table 1 that most participants have received information about COVID-19 from various sources such as websites of official entities, television, radio, seminars/meetings/ communication groups, social media, etc., and are well informed. On the evaluation of the attitude section, it can be interpreted that 99.2% of participants have an opinion that the oral cavity is a potential high-risk route for COVID-19 infection, and 53.3% of participants were aware of the presence of Angiotensin-converting enzyme 2 (ACE-2) receptor of SARS-CoV-2 on the epithelial cells of the oral mucosa, with 46.7% participants reported to not know about it. However, 41.3% of the participants thought that there is a probable correlation between COVID-19 and periodontitis, with 94.6% of participants responding to being aware of the possible systemic effects of periodontitis and 90.5% of participants were mindful of the mechanism of how periodontal disease can affect systemic health.

Table 1. Descriptive analysis of the participants' COVID-19 and periodontitis knowledge, awareness, and attitude.

Questions	N	%	p-value
Self-Assessed COVID-19 Knowledge			
I Have no Idea	1	0.4	<0.001
Insufficient	8	3.3	
Moderate	103	42.6	
Sufficient	112	46.3	
Comprehensive	18	7.4	
Do you believe that the infection by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a risk for the dentist?			
Unlikely	7	2.9	<0.001
Very Unlikely	7	2.9	
Likely	61	25.2	
Very Likely	167	69.0	
Where do you receive the information about COVID-19 from?			
The websites of official entities such as the Ministry of Health, WHO, and professional organizations and their social media accounts	199	82.23	
Physicians' personal websites/ social media accounts	108	44.62	
Television, radio	158	65.29	
From medical books, medical journals, or articles (printed or online)	103	42.56	
Events such as seminars/ meetings/ congresses held by institutions	97	40.08	
Communication groups such as WhatsApp, telegram	101	41.73	
I have not received any information so far	06	2.479	
Others	12	4.95	
Attitude Questions			
Have you attended an informational meeting on COVID-19?	No	97	40.1
	Yes	145	59.9
Do you think that the oral cavity is a potentially high-risk route for COVID-19 infection	No	2	0.8
	Yes	240	99.2
Do you know about the presence of Angiotensin-converting enzyme 2 (ACE-2)receptor of SARS cov2 on the epithelial cells of oral mucosa?	No	113	46.7
	Yes	129	53.3
Are you aware of the probable systemic effects of periodontitis?	No	13	5.4
	Yes	229	94.6
Are you aware of the mechanism of how periodontal disease can affect systemic health?	No	23	9.5
	Yes	219	90.5
Do you know about the Cytokine storm associated with COVID-19 illness?	No	103	42.6
	Yes	139	57.4
Is there a probable correlation between COVID-19 and periodontitis?	No	24	9.9
	Yes	100	41.3
	May be	118	48.8

The participants implemented many preventive measures in their daily lives against COVID-19, such as hand washing, frequent hand sanitization, mouth masks, social distancing and not being in overcrowded places, using HEPA filters and different combinations of protective measures against COVID-19 (Table 2).

Table 2. Descriptive analysis of the preventive measures implemented by the participants in their practice against COVID-19.

Questions	N	%
Which of the following preventive measures do you implement in your daily life against COVID-19?		
Face mask/face shield	129	53.30
Hand Gloves	99	40.90
Frequent hand washing	115	47.52
Hand sanitizers	118	48.76
No handshaking / no embracing / no kissing	69	28.51
Not being in crowded places / Social Distancing	72	29.75
Frequent ventilation for a healthy indoor environment/ HEPA Filters	55	22.72
All of the above	145	59.91

Which mouthwash do you prefer using before starting the dental treatment?			
Chlorhexidine gluconate 0.2%		145	59.9
Povidone iodine 2%		75	31.0
Hydrogen peroxide 1.5%		10	4.1
I do not use any mouthwash		12	5.0
Which of the following measures do you apply to your patients in your professional life against COVID-19?			
Before a dental procedure, I ask patients if they have symptoms such as a fever and a cough		126	52.06
I'm applying a rubber dam Before a dental procedure		31	12.81
Before a dental procedure, I have patients rinse their mouth with mouthwash		105	43.38
I use a strong absorbent system during the process		28	11.57
I avoid all the procedures that will create aerosols as much as possible		55	22.72
I apply the 14-day waiting rule to potentially infected patients		43	17.76
All of the above		103	42.56
None		02	0.82
Which measures do you implement in your professional life against COVID-19?			
Mask/ N95 Mask		120	49.58
Respirators		34	14.04
Gloves		112	46.28
Goggle		53	21.91
Face Shield		96	39.66
Disposable apron / PPE Kits		66	27.27
Frequent hand washing		104	42.97
Frequent hand sanitizing		108	44.62
All of the above		137	56.61
Which measures do you implement in your professional life against COVID-19?			
Do you measure the patient's body temperature before entering the dental clinic?	No	40	16.5
	Yes	202	83.5
As a dentist, do you inform your patients about COVID-19	No	18	7.4
	Yes	224	92.6
Do you check for periodontal pockets during routine examination	No	30	12.4
	Yes	212	87.6
Are you demonstrating brushing techniques to your patients?	No	15	6.2
	Yes	227	93.8
Are you advising your patients to clean their tongues?	No	16	6.6
	Yes	226	93.4
Are you prescribing any mouthwash to your patient during the COVID-19 pandemic?	No	39	16.1
	Yes	203	83.9

Referral of patients to periodontist by the participants is shown in Figure 2, where 56.6% of the participants referred the patient to a periodontist for treatment in the last three months, while 15.7% were referred in the previous six months, 8.7% were referred in the last one year while 38 (15.7%) did more than one year ago. Only 3.3% never referred their patient to a periodontist.

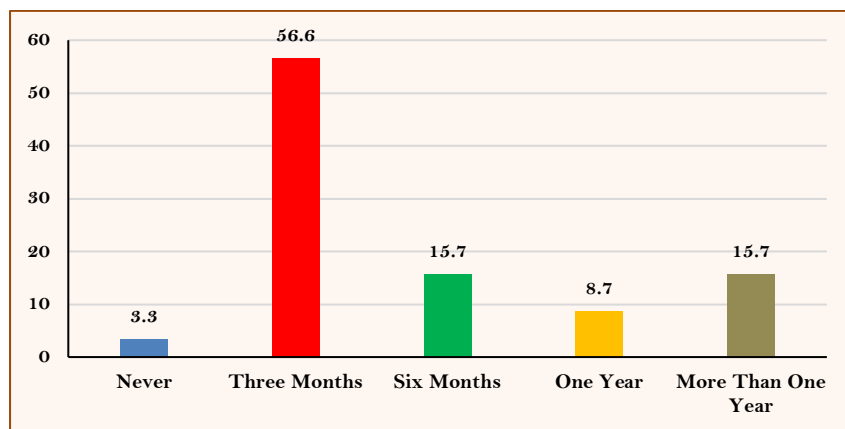


Figure 2. Referral of patients to periodontist by the participants.

Discussion

The COVID-19 pandemic has changed how dental surgeons practice in different setups by changing their general attitude and practices towards dental treatments and by updating their treatment protocol, infection control protocol, and knowledge pool. The present study was conducted to assess the orientation of dental practitioners in understanding the probable relationship between COVID-19 and periodontal infection and the measures they took toward periodontal health during the pandemic.

The present study shows that most dentists in Moradabad had adequate knowledge regarding the COVID-19 outbreak. General dental practitioners accounted for the majority of the participants. Dentists from different specialties participated wholeheartedly in this study. The self-assessed COVID-19 knowledge of the participants was moderate and sufficient, while only a few reported having insufficient knowledge. The "p" value was 0.001, which was significant. Many dentists believed that infection by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was a significant risk factor for dentists. The participants received information from different sources and had optimal knowledge regarding the COVID-19 infection, but that information needed to be appropriately streamlined, and overlapping of the information was reported.

Sequential dissemination of information and sensitization of their present knowledge was missing. Almost half of the participants had not attended any informational meeting regarding COVID-19 despite believing they were likely to contract COVID-19 while providing dental treatments. Many dentists believe the oral cavity is a potentially high-risk route for COVID-19 infection. Most participants were aware of the probable systemic effects of periodontitis and the mechanism of how periodontal disease can affect systemic health.

Marouf et al. [24] in their study concluded that periodontitis was associated with a higher risk of ICU admission, need for assisted ventilation, death of COVID-19 patients, and increased blood levels of biomarkers linked to worse disease outcomes. In this study, while only a little over half of the dentists knew about the presence of the Angiotensin-converting enzyme 2 (ACE-2) receptor of SARS cov2 on the epithelial cells of oral mucosa and the cytokine storm associated with COVID-19 illness, a significant lacuna in their knowledge bandwagon was found. Chlorhexidine gluconate was the choice of mouthwash for 0.2% (59.9%) before starting any dental treatment, and 5% reported not using mouthwash at all. Hydrogen peroxide 1.5% was used by 4.1% of the dentists, while 31% used povidone iodine 2% as a pre-treatment mouth rinse. They used majorly chlorhexidine gluconate 0.2%, povidone iodine 2%, and a small number of them used hydrogen peroxide 1.5%, and only a handful of them did not use any mouthwash. When asked about the measures applied by the dentists to their patients against COVID-19, 52.06% asked patients if they had symptoms such as fever and a cough before starting any dental procedure, and 12.81% of the dentists applied rubber dam before starting any dental procedure.

Studies suggest that there is a probable relationship between chronic periodontitis and COVID-19 infection concerning its impact on general health. It becomes crucial that both patients and dental surgeons keep a check on periodontal health, especially during times of such catastrophe. Keeping a check on the periodontal status may reduce the effect of COVID-19 infection on systemic organs, as both SARS-COV-2 and chronic periodontitis induce inflammatory responses within the host.






Our study highlights that dental surgeons are aware of the risk associated with COVID-19 in dental practice and, in this respect, are following protocols for the prevention of transmission of infection. Even though dental surgeons admitted to enforcing oral hygiene instructions, including the use of mouthwash, screening for pockets, and tongue cleaning, most of them were unaware of the mechanism of transmission of COVID-19 infection through the oral cavity and also the probable synergistic effect of chronic periodontitis and COVID-19

infection on general health. Therefore, more comprehensive learning should be organized for dental surgeons to understand the systemic effects of periodontitis, which could accentuate the impact of COVID-19 infection. This could lead to better education and patient treatment protocols in the dental practice during such pandemic times.

Conclusion

Due to the inflammatory changes induced by both COVID-19 and periodontitis, it becomes vital that dental surgeons pay significant attention to studying the mechanism by which these conditions can affect general health and as well take measures to check for periodontal health during such times, so as that inflammatory process induced by chronic periodontitis does not synergistically add on to the effects of COVID-19 infection. Even though the majority of participants endorsed oral hygiene measures and the use of mouthwashes to their patients, a significant number of dental surgeons were not aware that a probable correlation between COVID-19 infection and chronic periodontitis could exist that would further deteriorate the general health of an individual who would be suffering from periodontal infections and acquired COVID-19 as well. In this regard, dental surgeons must be educated thoroughly to provide more comprehensive oral health care to maintain good oral hygiene during such times.

Authors' Contributions

MK	 https://orcid.org/0009-0007-8348-5013	Conceptualization, Methodology, Validation, Formal Analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review and Editing and Visualization.
SM	 https://orcid.org/0000-0003-1077-984X	Conceptualization, Methodology, Formal Analysis, Investigation, Writing - Original Draft, Writing - Review and Editing, Visualization, Supervision and Project Administration.
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All authors declare that they contributed to a critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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