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COVID-19 prevalence and infection control practices among dentists in Andhra Pradesh State, India

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Abstract.
BACKGROUND: The coronavirus 2019 (COVID-19) pandemic posed a new challenge not only to public health but also to the health care systems and dentists are one of the highly vulnerable health care professionals for COVID-19 infection.
OBJECTIVE: To assess the COVID-19 prevalence, associated factors, and infection control practices among dentists in Andhra Pradesh State, India.
METHODS: A cross-sectional web-based questionnaire survey was conducted among dentists in Andhra Pradesh State, India. 21-item pretested questionnaire was used for data collection between January 30, 2021 and February 21, 2021. 3700 dentists from the Andhra Pradesh state were selected from the Dentists Register of India through systematic random sampling method.
RESULTS: Out of 3700 dentists invited to participate in this study, responses from 1876 dentists were received with response rate of 51%. Prevalence of 8 among the study population was 9%. Patients were the primary source of infection for 60.5% of the COVID-19 positive study participants. 65.8% of total respondents using full face shield and two-third of them using N95 or equivalent mask while providing dental care.
CONCLUSION: This study found a high prevalence rate of COVID-19 among the dentists. Among the associated factors, being into active practice during the pandemic was found to be statistically significant. This study recommend for additional infection control protocols specific to the COVID-19 pandemic.

Keywords: Cross infection, dental practice, personal protective equipment, dental aerosols, contaminated surfaces, disinfection

1. Introduction

Coronaviruses belong to a group of RNA viruses that can cause severe respiratory infections. The virus is highly infectious, and it spreads through droplets

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produced by speaking, coughing, and sneezing [1]. Since the occurrence of a Spanish flu pandemic in the 1900 s, many outbreaks have occurred globally which include severe acute respiratory syndrome coronavirus (SARS-CoV-1 in 2003), the Middle East respiratory syndrome coronavirus (MERS-CoV in 2012), Ebola and Zika viruses in 2014, and recently, the outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 or COVID-19 in 2019) [2]. SARS-CoV-2 was first reported from Wuhan, China and was said to be one of the most swiftly spreading pandemics affecting more than 82 million people of all age groups worldwide [3, 4]. To contain the pandemic, many countries implemented remote working and strict lockdown measures and emphasized social distancing, hand hygiene and personal protection measures [5].

As more information appeared on the mode of transmission, it is now proven that SARS-CoV-2 is air borne and spreads through infected aerosols ($\leq$5 mm) and droplets (5-12 micrometers) from symptomatic and asymptomatic individuals [5, 6]. The infected aerosol can remain airborne for few hours and on the contaminated surfaces for up to 72 hours (about 3 days) [5–7]. Indirect spread or transmission of SARS-CoV-2 can occur from the contaminated surfaces through the mucous membranes of ear, nose, and mouth by self-innoculation [8].

Health workers are most vulnerable groups for coronavirus 2019 (COVID-19) cross infection [9]. Dental operatory has been considered as one of the potential areas for the spread of this dreadful disease. Standard dental procedures such as using high-speed hand piece, ultrasonic scalars, air-water-pressure (3-in-1) syringes and hard tissue LASERS are aerosol-generating procedures (AGPs) [10]. These aerosols in enormous quantities remain splattered in the air for at least 30 minutes before settling on the surrounding surfaces and will invariably contaminate them [6, 11]. Dentists and their auxiliaries are at considerable risk of being exposed to SARS-CoV-2 [10, 12]. Considering the above consequences, many countries suspended regular dental services during the initial stages of the SARS-CoV-2 outbreak and all AGPs in particular [6, 13, 14].

The World Health Organization has laid down the interim guidelines for the clinical management of COVID-19 in health services [14]. Besides, several health services governing bodies like Centre for Disease Control and Prevention (CDC), Indian Council of Medical Research (ICMR), Dental Council of India (DCI) and other dental associations across the globe have endorsed the infection control guidelines for hospitals rendering medical and dental services. One such recommendation is the usage of PPE (Personal protective equipment) for all health care workers involved during the procedure [14, 15].

With new mutant strains of the virus appearing in different countries, it is evident that COVID-19 is going to stay for a long time. As dental practices pose a potential area of cross-infection and the role of dentists in containing the spread of COVID-19 is critically important [14, 16]. The need to assess the risk and follow all infection control protocols is justified. Therefore, the present study was aimed to estimate the prevalence, its associated factors and infection control practices of COVID-19 among the dentists in Andhra Pradesh State, India.

2. Materials and methods

The data was collected between January 30, 2021 and February 21, 2021 through an online survey using Google Forms. Participants were initially selected from the DCI Indian Dentists Register [17], as this is the most comprehensive official list available having name of each dentist and their registration numbers. The selected dentists' e-mail addresses were obtained from the directory of the Andhra Pradesh State Indian Dental Association (AP state IDA) and members of the AP state IDA that represents 91% of the total practicing dentists in this state. The questionnaire and a brief description of the survey's purpose have been sent to the dentists' emails on January 30, 2021 and reminder email to fill the questionnaire were sent on February 11, 2021. The participating dentists were asked to declare that they have read the data privacy policy and voluntarily agreed to fill the questionnaire.

2.1. Questionnaire

The designed questionnaire has 21 items under four domains. The first set of seven questions were related with the personal data of the participants (age, gender, location of practice, type of practice, specialty, etc.) followed by nine questions regarding COVID-19 (exposure, RT PCR test details, possible source of cross infection, symptoms relative to COVID-19, etc.), and finally five questions related to infection control practices employed in their practices to prevent COVID-19 transmission. Participants were asked to answer the questions based on their own experiences or events from mid of the March 2020 to

December 31, 2020, as the first COVID-19 case was reported on March 12, 2020 in Andhra Pradesh, India [18].

The basic items in the questionnaire were derived from the previous similar studies published by Estrich et al. [5] and Cagetti et al. [19]. The questionnaire was pretested on a sample of twenty participants by asking the participants to fill the printed questionnaire under the presence of investigators. They were then asked if they encountered any difficulties/doubts in filling the questionnaire. Corrected Item-Total Correlation (CITC) was used initially to weigh the reliability and CITC value > 0.30 was taken as the cut-off point [20]. Only two questions in the initial questionnaire got values < 0.30 and those two questions were reframed and retested. Apart from CITC, Cronbach's alpha was calculated for final questionnaire, and the overall value was 0.92.

2.2. Sample size

The basis for sample size calculation was the prevalence of COVID-19 (Positive/Negative). There were no previous studies reported about prevalence of COVID-19 among Dentists from India, but Jha et al. reported a study from India where the prevalence was 1.9% in health care workers [21]. Whereas the prevalence in dental practitioners reported from various countries was below 5% and we followed sample size determination procedures described by Amin et al. [22] for prevalence studies in which expected prevalence is less (<5%). Therefore, 1825 samples were enough to detect statistically significant difference with 95% CI (Confidence Interval) and 80% power where expected/estimated prevalence is $\leq 2\%$. Participant response rate reported in similar studies [5, 19] were between 40-50%, hence we also anticipated response rate of 45-50% for our study and accordingly the sample size was increased to 3700. The final sample included 3700 dentists who were selected through the systematic random method from the Indian Dentists Register.

2.3. Ethical approval

All procedures followed in this survey are in concordance with the Declaration of Helsinki and the study was approved by the Institutional Ethics Committee (IEC) of Drs SNR Siddhartha Institute of Dental Sciences, India (IEC: 136/2020-21).

2.4. Statistical analysis

Statistical analysis was done with SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated for most of the questions. In estimating the COVID-19 prevalence, linear trends were used for statistical weighing to make sure that our study sample represented the licensed/registered dentists in DCI's register. Comparison of variables in COVID-19 positive/negative dentists were done; Mann-Whitney U test for ordinal variables and Chi-square test or Fisher's exact test for categorical or nominal variables were used to test the statistical significance. Binary logistic regression was performed to predict the influence of various variables on COVID-19 positivity among the participants and only the variables which were found to be significant in bivariate analysis were included in logistic regression model. For all comparisons $P \leq 0.05$ was considered statistically significant.

3. Results

Among the 3700 dentists who were invited for this study, 1887 dentists agreed and filled the questionnaire with response rate of 51%. Incomplete data or missing data was observed in 11 responses therefore we eliminated them from analysis and the final analysis included responses from 1876 dentists.

3.1. Participant characteristics

Table 1 shows the socio demographic features of the participant dentists. More than half (56.5%) of the participants were 32-60 years, followed by the above 60 years and below 30 years age group, which is almost similar to national data. 52% of the participants were males and 48% of them were females which is in contrary to national data, where female dentists were more compared (70% vs 30%) to male counter parts which is statistically significant ($P = 0.001$). 57% of the study participants were general dentists (without post-graduation) and 43% of the participants are specialists (having an additional qualification i.e., masters) which is again different from National data in which general dentists comprise of 90% of total dentists. Among the specialists, Prosthodontists, Oral and Maxillofacial Surgeons and Endodontists were the top three categories and specialists in Community dentistry, Oral pathology and Oral medicine were the bottom three in terms of number of participants. 64% of the dentists were in private

Table 1
Demographic data of the participants

Characteristic	Unweighted sample, $N = 1876$ *n* (%)	DCI register of dentists $N = 277569$ *n* (%)	Chi-square test *P*-value
Age group			
Below 31 years	403(21.5%)	063841(23%)	0.23
32-60 years	1061(56.5%)	147111(53%)	
Above 61 years	412(22%)	066617(24%)	
Total	1876	277569	
Gender			
Male	975(52%)	083271(30%)	0.001
Female	901(48%)	194298(70%)	
Other		None	
Qualification			
General dentist	1068(57%)	247112(90%)	0.001
Specialist	808(43%)	30547(10%)	
Specialty			
Operative dentistry and endodontics	121(15%)	NR	
Oral and maxillofacial pathology	53(6.5%)		
Oral and maxillofacial surgery	126(15.5%)		
Oral medicine and oral radiology	51(6.3%)		
Orthodontics	73(9%)		
Pediatric dentistry	71(8.8%)		
Periodontics	108(13.4%)		
Prosthodontics	186(23.2%)		
Public health dentistry	19(2.3%)		
Employer			
Government health service	11(0.6%)	NR	
Teaching institution	660(35.2%)		
Voluntary organization/NGO	3(0.2%)		
Private practice	1202(64%)		
Location of practice			
Urban (city/town)	1627(86.8%)	NR	
Peri-urban (city/town, outskirts)	238(12.7%)		
Rural	11(0.6%)		

*DCI: Dental Council of India. ≠ NR: Not recorded due to non-availability of data.

practice and 86.8% of them were practicing in urban areas.

3.2. COVID-19 prevalence

The overall prevalence of COVID-19 among the participants was 9% (170 of 1876 participants) among which nearly three-fourth of the cases were in 32-60 year age group. Male dentists are proportionately more affected than female counterparts (70% vs 30%) which is statistically significant ($P = 0.001$). 151 of 170 cases were reported in urban participants and 69 out of 170 had at least two predisposing health conditions, 43 out of 170 had one condition that increased the vulnerability of COVID-19 (Table 2).

3.3. Self-reported symptoms among the participants

Approximately 66% of COVID-19 positive cases had at least one symptom, which is known to be associated with COVID-19 infection against 4% in the COVID-19 negative group. 21.8% had two symptoms and 12.3% had no symptoms in the COVID-19 positive group (Table 2).

3.4. Source of infection

77% of the participants said that they could not identify or know the source of infection, which were determined by contact tracing. Patients in the workplace were the source of cross infection for 60.5% of the COVID-19 positive participants. Among the dental procedures, scaling (29.1%) and endodontic procedures (28.2%) were notified as major treatments done to such patients (Table 3).

3.5. Participant's activities

22.9% and 12.3% of the participants in the COVID-19 positive group performed emergency dental care and elective dental care against 13.7% and 19.7% in the COVID-19 negative group. 10.6% of the participants in the COVID-19 positive group had

Table 2
COVID-19 prevalence and associated factors among the participants

	COVID-19 positive	COVID-19 negative	Statistical test	
			Test name	*P*-value
Age group				
Below 31 years	21(12.4%)	381(22.3%)	Mann-Whitney U test	0.482
32-60 years	125(73.5%)	936(54.9%)		
Above 61 years	24(14.1%)	388(22.8%)		
Overall	170(100%)	1706(100%)		
Gender				
Male	119(70%)	856(50.1%)	Chi-square test	0.001
Female	51(30%)	850(49.8%)	(χ2 test)	
Work location				
Urban (city/town)	151(88.5%)	1476(86.5%)	Chi-square test	0.084
Peri-urban (city/town, outskirts)	18(12.9%)	220(12.9%)		
Rural	01(0.6%)	10(0.6%)		
Qualification				
General dentist	114(67%)	954(56%)	Chi-square	0.562
Specialist	56(33%)	752(44%)	test	
General health condition				
No debilitating health problems	51(30%)	861(50.5%)	Chi-square test	0.288
One condition	43(25.3%)	503(29.5%)		
Two conditions	69(40.6%)	281(16.4%)		
Three or more conditions	07(4.1%)	061(3.6%)		
Participants self-reported symptoms				
No symptoms	21(12.3%)	1638(96%)	Mann-Whitney U test	0.46
One symptom/sign	112(65.9%)	68(4%)		
Two symptoms/signs	37(21.8%)	0		
Three or more symptoms/signs	0	0		

Table 3
Participants self-reported source of infection and dental procedure done for patients

Source of infection	Unweighted sample, number (%)
Cannot identify source of transmission	46(27%)
Colleagues/auxiliaries in clinic	11(6.5%)
Family members	8(4.7%)
Patients in workplace	103(60.5%)
Others	2(1.3%)
For the dentists who mentioned patients as a source of infection	
(n = 103)	11(10.7%)
Dental procedure performed on such patient:	30(29.1%)
• Oral diagnosis/X-ray	8(7.8%)
• Scaling	29(28.2%)
• Restoration/crown preparation using high speed hand piece	00
(Aerotor)	11(10.7%)
• Endodontic procedure	4(3.9%)
• Impression or crown cementation	10(9.6%)
• Closed extraction	
• Disimpassion or other surgical procedures	
• More than one of the above-mentioned procedures	

contact with suspected or confirmed COVID-19 patients before they were tested positive against 4.9% COVID-19 negative, which is statistically significant (Table 4).

3.6. Infection control practices followed by participants

Table 5 compares the infection control practices among the COVID-19 positive and COVID-19 negative dentist groups. No significant differences in the infections control practices were found between the groups except the usage of pre-procedural mouth wash: 13.5% of dentists in the COVID-19 positive group and 27.8% in COVID-19 negative group used pre-procedural mouth rinse with Chlorhexidine for all patients, followed by Betadine mouth wash (10% vs 9.4%), Listerine mouth wash (2.9% vs 0.5%) and Mouthwash containing Cetyl peridium chloride (3.5% vs 1.9%).

Logistic regression analysis was performed to identify the predictors of COVID-19 among the participants, among the factors included in the model having involved dental practice increased risk of COVID-19 infection (odds ratio = 2.8; P = 0.001).

4. Discussion

This study was conducted during the period of peak diffusion of COVID-19 cases in India, with 8,869,576 cases reported until December 20, 2020.

Table 4
Participants self-reported activities prior to survey administration

	COVID-19 positive (*n* = **170**)	COVID-19 negative (*n* = **1706**)	Overall (*N* = 1876)	Chi-square test (Fisher's exact test) *P*-value
Involved in dental practice (either emergency or elective care)	170(100%)	1186(69.5%)	1356(72.2%)	0.024
Provided emergency dental care	39(22.9%)	234(13.7%)	273(14.5%)	
Provided elective dental care	21(12.3%)	336(19.7%)	357(19%)	
Attended a health care visit for myself or a companion	4(2.4%)	21(1.3%)	25(1.3%)	
Met with a group of 10 or more people in a social setting	18(10.6%)	168(9.8%)	186(9.9%)	
Attended any public event with 50 or more people	00	8(0.5%)	8(0.4%)	
Traveled by taxi, ride share, or public transportation	11(6.5%)	134(7.8%)	145(7.72%)	
Had contact with anyone with suspected or confirmed COVID-19	18(10.6%)	83(4.9%)	101(5.3%)	
More than one activity along with dental care	59(34.7%)	616(36.1%)	675(35.9%)	
None of the above activities	00	106(6.2%)	106(5.6%)	

Andhra Pradesh is in the Southern part of India and is reported to be one of the three states with the highest number of COVID-19 cases reported since the outbreak of the pandemic [23].

In the literature search, most of the studies from India involving dentists or dental settings reported either knowledge, attitudes, and practices related to COVID-19 [24] or reported on dentist's perceptions about stress, vulnerability, etc. [25], but the prevalence of COVID-19 among dentists and its associated factors were not reported until date (Jan. 30, 2021). However, a study from the United States reported that COVID-19 prevalence among the dentists was 0.9% [5], and study from the Northern part of Italy described that the COVID-19 prevalence among the dentists was 0.86% [19].

In the present survey, the percentage of dentists diagnosed with COVID-19 was 9%, which is much greater than the prevalence reported in the inhabitant population in that area (0.73%) [26]. COVID-19 prevalence reported in this study was also much higher (9% vs 1.8%) than other health workers in India [21]. This data suggests that there is a greater COVID-19 infection diffusion among dentists. All dentists who were reported as COVID-19 positive were tested through RT-PCR technique (nasal swabs) as no other tests were available at that period.

In the present study, 70% of the COVID-19 positive cases were reported in male dentists. Similar findings were reported in the National Serosurvey for COVID-19 in which the seropositivity in males was 1.5 times more than females [26] and in contrast to the study reported from Wuhan, China in which females are more affected than males [27]. The probable reason behind this could be that more male dentists work full-time compared to female counter parts [28] and high-risk activities were more common in males than females [29].

Nearly one-third of the COVID-19 positive dentists in this study could not identify the source of infection through currently followed contact-tracing mechanism and 60.5% participants mentioned that patients are the source of infection. The statements given by them could be duly supported because many dental procedures involve high-speed hand pieces that emit aerosols, which serve as a vehicle for virus transmission. In addition to these findings, two-thirds of the dentists performed ultrasonic scaling or used a high-speed hand piece to treat such patients who were tested positive immediately after dental treatment. A logistic regression model also identified dental practice as the single most statistically significant factor and had a 2.8 times more risk of being COVID-19 positive. High prevalence and being involved in active dental practice during the pandemic as a risk indicator for COVID-19 is alarming for the future of the dental profession, as the survey in Slovakia reported that 40% of the dentists have the intention to leave the profession due to fear of COVID-19 [30].

COVID-19 prevalence rate found in this study are in contrast to the study reported Manzar et al., only one dentist was COVID-19 positive out of forty dentists who performed Aerosol producing dental procedures during the pandemic [31]. The dentists in this study, however, were worked under different settings, i.e., part of testing new COVID-19 infection

Table 5
Dentists' self-reported infection control practices since March 2019

	COVID-19 positive ($n = 170$)	COVID-19 negative ($n = 1186$)	Chi-square test/ Fisher's exact test *P*-value
Screen or interview patients for known or suspected COVID-19 infection before dental appointment or treatment	119(70%)	915(77.2%)	0.26
Check patient temperatures with a thermometer before dental treatment	110(64.7%)	808(68.9%)	
Check yours and other staff's temperatures with a thermometer at the beginning of their shift	102(60%)	212(17.9%)	
Disinfect frequently touched surfaces and materials such as pens or light switches	119(70%)	983(82.9%)	
Disinfect all equipment in the operatory between patients	119(70%)	1095(92%)	
Encourage distance between patients, such as scheduling appointments farther apart, asking patients to wait elsewhere, or asking patients not to bring companions	118(69.4%)	1026(86.5%)	
Physical protection in the practice, such as erecting barriers, opening windows, or using air filters or scrubbers	85(50%)	604(50.9%)	
Provide face masks or coverings to staff	117(68.8%)	1115(94%)	
Provide face masks or coverings to patients	116(68.2%)	114(9.6%)	
Personal protective equipment (PPE)			
• Eye protection	110(64.7%)	524(44.2%)	0.64
• Full face shield	104(61.2%)	1131(95%)	
• N95 mask	110(64.7%)	126(10.6%)	
• N95 equivalent mask	58(34.1%)	963(81.2%)	
• Sterile gown	105(61.8%)	897(75.6%)	
• Shoe covers	19(11.2%)	70(5.9%)	
• Surgical mask	2(1.2%)	49(4.1%)	
Do you change masks/respirators?			
• In between each patient	52(30.6%)	639(53.9%)	0.44
• In between multiple patients	92(54.1%)	493(41.6%)	
• Once in a day/once for each clinical session	26(15.3%)	54(4.6%)	
Use of pre-procedural mouth wash			

Type of mouthwash	For all patients		For some patients		Not used for any patients	
+Ve group	– Ve group	+Ve group	– Ve group	+Ve group	– Ve group	
Chlorhexidine mouthwash	23(13.5%)	211(17.8%)	14(8.2%)	106(8.9%)	12(7.1%)	964(81.3%)
Betadine mouthwash	17(10%)	111(9.4%)	8(4.7%)	59(5%)	91(53.5%)	1044(88%)
Listerine mouthwash	5(2.9%)	6(0.5%)	7(4.1%)	18(1.5%)	165(97.1%)	1128(95%)
Mouthwash containing Cetyl peridium chloride	6(3.5%)	22(1.9%)	7(4.1%)	31(2.6%)	151(88.8%)	1113(93.8%)
χ^2 test	P=0.001	P=0.43	P=0.08			

*+Ve group = COVID-19 Positive group of Dentists; – Ve group = COVID-19 Negative group of Dentists.

control protocol and working under supervision may positively influence adherence to infection control protocols [31].

Among the infection control practices, two-third of the dentists used protective full-face shield and N95 or equivalent masks while performing dental care, which is similar to the study reported by Banaee et al. [32] among dentists in the US, where 56% of them wear N95 or equivalent masks. The frequency of changing the mouth masks in between the patients varies among the dentists, where few changed it for every patient and others changed between multiple patients or once in a day. Only a few dentists used pre-procedural mouthwash, which is an effective measure to reduce viral load in the patient's oral cavity. Such differences in practices among dentists call a need to develop evidence-based guidelines and specific protocols in the dental practice.

The present study was the first large-scale study reporting about the prevalence of COVID-19 among dentists from India to the best of our knowledge. The sample was representative of Indian Dentists as the participants were selected from the Indian Dentists Register, which allows comparison among

Table 6
Logistic regression to assess effects of few variables on COVID-19 infection

	P-value	Odds ratio (EXP(B))	95% CI for EXP(B)
Gender	0.29	1.42	1.22-1.82
Provision of dental care	0.001	2.8	2.4-3.4
Activities other than dental care which increases the risk of COVID-19 infection	0.08	0.88	0.79-1.04
Pre-procedural mouth wash for patients	0.44	1.16	0.98-1.30

the subgroups. However, this study had few limitations. Dentists represent a highly motivated group who would have undergone COVID-19 testing upon any obvious symptom or perceived risk more than the public, which could increase the reported prevalence rate among dentists compared to the public. Moreover, COVID-19 testing was not mandatory in India for the public unless they were demanded or were identified by the health workers as vulnerable groups through contact tracing [18].

The response rate (51%) in the present study was more compared to other similar studies, such as 40.1% among the US Dentists [5] and 41.60% in another study reported from Italy [19]. Also, non-participating dentists may differ from participants, which lower the validity and generalization of findings. Although the response rate of our study met with optimal response rate (50-60%) suggested by Duagalis [33] and it was suggested that survey findings with a response rate of less than 65% should be applied with caution [33]. In addition, there are chances of under reporting COVID-19 prevalence and symptoms among dentists because some of the non-respondents would have succumbed to COVID-19 infection or were unable to participate due to hospitalization.

Another limitation of the study could be the recall bias, as participants had to answer several questions based on the past few months' experiences; but the chances of recall bias may be less as all study participants were professionals. The nature of questions enquired were about COVID-19 symptoms, testing, test result (positive/negative), etc. are not related to day-to-day activities and certainly, there should not be an inadequate answer, and the participant dentists would not have serious difficulty in recollecting.

Due to the cross-sectional nature of the data, the association between infection control practices and COVID-19 infection among the dentists was not tested. Future studies should include assessment of COVID-19 incidence among the same cohorts and identification of risk factors for COVID-19 cross infection among the dentists.

5. Conclusion

The estimated prevalence of COVID-19 among dentists in Andhra Pradesh state is 9%, which is alarming. Such high prevalence rate demands strict adherence to ICMR standard operating procedures for the dental operatory and dentists need to be further educated about infection control protocols for implementation and maintenance of safe practices.

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Conflict of interest

None to report.

Ethics statement

All procedures followed in this survey are in concordance with the Declaration of Helsinki and the study was approved by the Institutional Ethics Committee (IEC) of Drs SNR Siddhartha Institute of Dental Sciences, India (IEC: 136/2020-21).

Informed consent

Not applicable.

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