

Infection Control Measures practiced by Oral and Maxillofacial Surgeons during COVID-19 Pandemic: A Cross-sectional Study

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ABSTRACT

Aim: Since the source of the coronavirus disease 2019 (COVID-19), it has become global health emergency. It is life threatening condition and dentistry has been classified as the high-risk job let alone be the oral and maxillofacial surgeons, because of direct exposure to blood and saliva. The standard although are good are not sufficient during the pandemic like COVID-19. Adequate screening as well as the proper infection control measures are recommended. To know Infection control measures practiced by oral and maxillofacial surgeons during COVID-19 pandemic.

Materials and methods: A cross sectional study was conducted on 353 oral maxillofacial surgeons to know the infection control measures practiced by them during COVID pandemic.

Results: This study shows that majority of infection control measures were practiced more in government hospitals when compared to private hospitals Chi-square test and logistic regression analysis was used. Statistical significance was set at $p < 0.05$.

Conclusion This study highlights that oral and maxillofacial surgeon practicing infection control measures like use of prophylactic medication, high volume extra oral suction, negative pressure room, use of heap filters, fumigation system, and use of chemicals for disinfection were less likely to be affected by COVID-19.

Clinical significance: The findings of this study will help us to provide practical advice to oral surgeons regarding appropriate use of infection control measures to protect themselves from the risk of COVID-19 infection during surgical procedures.

Keywords: Covid-19, Infection control measures practices, Oral and maxillofacial surgeons.

Key message: Extensive Infection Control Measures in the field of Dentistry should be practiced on daily basis especially during pandemic like COVID-19, to contain spread of infection.

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INTRODUCTION

Coronavirus disease, also known as COVID-19, has spread to many countries since originating in Wuhan, China in 2019 and has become a global health emergency.¹⁻³ COVID-19 pandemic has affected healthcare system globally especially dentistry due to aerosol generating procedure.³⁻⁵

The Occupational Safety and Health Administration (OSHA) report on guidelines for preparing workplaces for COVID-19 has classified dentistry as a very high-risk job.^{5,6} While the standard precautions are good, they are of little use in containing the highly contagious COVID-19 virus. Protection against infection begins with the patient visit with adequate screening and hand hygiene.⁵⁻⁸ In order to reduce surface contamination by the aerosols generated during the high efficiency particulate air (HEPA) filter process, adequate ventilation, high volume suction, and the use of chemical disinfectants and fumigations are urgently required.^{2,4,6,7,9}

Oral and maxillofacial surgeons working in head and neck region dealing with emergencies such as maxillofacial trauma, space infections, and elective procedures such as oral cancer, orthognathic surgeries have high exposure to novel SARS-CoV2.¹⁰ They are exposed to COVID-19 infection due to the close contact with patients as it is very difficult to maintain interpersonal distance of more than a meter and they are also exposed to saliva, blood, and other body fluids during surgical procedures. Very few studies have

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been done regarding infection control measures especially during COVID-19 pandemic. So, this study regarding infection control measures practiced by oral surgeons will help us to provide practical advice to oral and maxillofacial surgeons regarding appropriate use of infection control measures to protect themselves from the risk of COVID-19 infection during surgical procedures.

Objective

To know Infection control measures practiced by Oral and maxillofacial surgeons during COVID-19 pandemic.

MATERIALS AND METHODS

- Study design: A cross-sectional study.
- Study population: Oral and Maxillofacial surgeons practicing either in Government or Private hospitals of India.
- Study period: Four months (August 2020 to January 2021).
- Sample size: A total of 353 Oral and Maxillofacial surgeons enrolled in the study.

As the prevalence of use of infection control measures among oral surgeons is varied, a prevalence of 50% was used to calculate the sample size.

$$n = \frac{Z_L^2 p(1-p)}{d^2}$$

where Z value for 95% confidence level 1.96

Absolute error = 5%

$$n = \frac{(1.96)^2 \times (50)(100 - 50)}{5^2}$$

N = 384

We know the population size, so sample size for finite population was

$$n^1 = \frac{n}{1 + \frac{(n-1)}{N}} \text{ where N = Population size}$$

$$n^1 = \frac{384}{1 + \frac{(384-1)}{3000}} \text{ where N = Population size}$$

$$n^1 = 353$$

Sampling method: A list of 3000 Oral surgeons in India was obtained from Association of Oral and Maxillofacial surgeons of India (AOMSI). By using systematic random sampling method 353 Oral and Maxillofacial surgeons were chosen. First participant was selected randomly and thereafter every 11th oral surgeon was selected as a study participant.

Study tool: Pretested, predesigned questionnaire was used with nine open-ended multiple-choice questions. Pilot study was done and questionnaire was modified according to the feedback obtained. The questionnaire was validated with Cronbach's alpha score of 0.72. Information regarding infection control measures practiced by oral and maxillofacial surgeons was collected. Information regarding whether active screening of patients for fever and symptoms of COVID-19 was done, was gathered. Information was collected using Google forms and the responses were saved in Microsoft excel sheet. The same was used for performing descriptive analysis on the data. The oral surgeons were grouped into private/government employees. The information regarding any variations in infection control protocols for major and minor surgical procedures by oral surgeons working in private/government setup was recorded. The present study was conducted before the advent of vaccine.

Table 1: Association between type of work place and use of Infection Control Measures

Infection control measures		Work place		p-value
		Government hospital	Private	
Use of prophylactic medication	No	0 (0%)	201 (79.76%)	0.000,4998* ^{MC}
	Yes	101 (100%)	51 (20.24%)	
Active screening for fever or COVID-19 symptoms	No	13 (12.87%)	31 (12.3%)	<0.00,001*
	Yes	88 (87.13%)	221 (87.7%)	
Recording of body temperature	Yes	101 (100%)	252 (100%)	-
	RT PCR testing	No	10 (9.9%)	
	Yes	91 (90.1%)	187 (74.21%)	
Use of appropriate PPE	Yes	101 (100%)	252 (100%)	-
Use of N 95 masks	Yes	101 (100%)	252 (100%)	-
Use of high volume extra oral suction	No	50 (49.5%)	151 (59.92%)	<0.00,001*
	Yes	51 (50.5%)	101 (40.08%)	
Use of the indoor air cleaning system	No	50 (49.5%)	151 (59.92%)	<0.00,001*
	Yes	51 (50.5%)	101 (40.08%)	
Use of dental chair water unit	No	101 (100%)	252 (100%)	-
Use of hand pieces	No	101 (100%)	252 (100%)	-
Presence of negative pressure room	No	0 (0%)	252 (100%)	0.000,4998* ^{MC}
	Yes	101 (100%)	(0%)	
Use of heap filters	No	0 (0%)	201 (79.76%)	0.000,4998* ^{MC}
	Yes	101 (100%)	51 (20.24%)	
Use of UV light	No	101 (100%)	252 (100%)	-
Use of fumigation systems	No	0 (0%)	151 (59.92%)	0.000,4998* ^{MC}
	Yes	101 (100%)	101 (40.08%)	
Use of chemicals for disinfection	No	0 (0%)	152 (60.32%)	0.000,4998* ^{MC}
	Yes	101 (100%)	100 (39.68%)	

MC, Monte-Carlo's simulation



Inclusion Criteria: Oral and Maxillofacial surgeons practicing in private/government setup who gave consent to participate in study.

Informed consent was obtained by study participants and confidentiality of identity was assured.

Ethical Clearance was obtained from Institutional ethics committee letter dated 3/9/20 vide no 1386.

Statistical Analysis: SPSS version 20 was used for analysis. Chi-square test and logistic regression analysis were used. Statistical significance was set at $p < 0.05$.

RESULTS

In the present study, the use of prophylactic medication by oral and maxillofacial surgeons, active screening for fever or COVID-19 symptoms and RT PCR testing among patients was more in government hospitals which were found to be statistically significant ($p < 0.05$). Body temperature was recorded prior to each surgical procedure by oral and maxillofacial surgeons who worked in both private and government hospitals. Regarding infection control measures during surgical procedures such as high-volume suction, use of room air purification system, HEPA filter, presence of the negative pressure room was seen more often in government

hospitals than in private hospitals, with the exception of natural ventilation, which was better in private hospitals. This difference was found to be statistically significant ($p < 0.05$). The use of the fumigation system was carried out more frequently in government hospitals compared to private hospitals. This difference was found to be statistically significant ($p < 0.05$). The use of suitable PPE, N 95 masks, has been practiced by both oral and maxillofacial surgeons, working in private and government hospitals. Whereas distilled dental water and handpieces were not used by government or private hospitals ($p > 0.05$) (Table 1).

In our study, 114 (32.29%) of oral surgeons were COVID-19 positive. The present study found that oral and maxillofacial surgeons who took history of COVID-19 symptoms and recorded body temperature measurements before procedures were less likely to be affected by COVID-19 infection compared to doctors who did not use the infection control measures, which was statistically significant ($p < 0.05$). The likelihood of not being affected by COVID is 12.0202 (CI: 6.2677–23.0522) times more for surgeons using prophylactic medication compared to surgeons not taking prophylactic medication. Surgeons who implemented infection control measures such as HEPA filters, high volume suction, worked in negative pressure room, and in the presence of natural ventilation

Table 2: Association between Infection Control Measures and COVID status of oral and maxillofacial surgeons

Infection control measures		COVID-19 status of Oral and maxillofacial surgeons		Odds ratio	CI	p-value
		Negative	Positive			
Use of prophylactic medication	No	99 (41.42%)	102 (89.47%)	12.0202	6.2677–23.0522	<0.0001*
	Yes	140 (58.58%)	12 (10.53%)			
Active screening for fever or COVID 19 symptoms	No	25 (10.46%)	19 (16.67%)			0.0988
	Yes	214 (89.54%)	95 (83.33%)			
Recording of body temperature	Yes	239 (100%)	114 (100%)			-
	No	47 (19.67%)	28 (24.56%)			
RT PCR testing	Yes	192 (80.33%)	86 (75.44%)			0.293
	No	47 (19.67%)	28 (24.56%)			
Use of appropriate PPE	Yes	239 (100%)	114 (100%)			-
	No	47 (19.67%)	28 (24.56%)			
Use of N 95 masks	Yes	239 (100%)	114 (100%)			-
	No	47 (19.67%)	28 (24.56%)			
Use of high volume extra oral suction	No	102 (42.68%)	99 (86.84%)	8.8647	4.8626–16.1606	<0.0001*
	Yes	137 (57.32%)	15 (13.16%)			
Use of the indoor air cleaning system	No	135 (56.49%)	66 (57.89%)			0.8025
	Yes	104 (43.51%)	48 (42.11%)			
Use of dental chair water unit	No	239 (100%)	114 (100%)			-
	Yes	104 (43.51%)	48 (42.11%)			
Use of hand pieces	No	239 (100%)	114 (100%)			-
	Yes	104 (43.51%)	48 (42.11%)			
Presence of natural ventilation	No	141 (59%)	111 (97.37%)	25.7163	7.9386–83.3054	<0.0001*
	Yes	98 (41%)	3 (2.63%)			
Presence of negative pressure room	No	49 (20.5%)	1 (0.88%)	29.1451	3.9696–213.9389	<0.0001*
	Yes	190 (79.5%)	113 (99.12%)			
Use of heap filters	No	99 (41.42%)	102 (89.47%)	12.0202	6.2677–23.0522	<0.0001*
	Yes	140 (58.58%)	12 (10.53%)			
Use of UV light	No	239 (100%)	114 (100%)			-
	Yes	104 (43.51%)	48 (42.11%)			
Use of fumigation systems	No	53 (22.18%)	98 (85.96%)	21.4953	11.6763–39.5711	<0.0001*
	Yes	186 (77.82%)	16 (14.04%)			
Use of chemicals for disinfection	No	65 (27.2%)	87 (76.32%)	8.6256	5.1419–14.4695	<0.0001*
	Yes	174 (72.8%)	27 (23.68%)			

during surgery, were less likely to be affected by COVID-19 infection compared to doctors who did not use infection control, which was statistically significant ($p < 0.05$). The probability of not being affected by COVID is 12.0202 (CI: 6.2677–23.0522) times more for the oral and maxillofacial surgeons who use heap filters compared to the subjects who do not use heap filters. The likelihood of not being affected by COVID is 29.1451 (CI: 3.9696–213.9389) times higher for those who use natural ventilation compared to those who do not use natural ventilation. The probability of not being affected by COVID is 25.7163 (CI: 7.9386–83.3054) for the subjects who use a negative pressure room compared to the subjects who do not use a negative pressure room. Surgeons using a fumigation system and chemical disinfection after surgery were less likely to be affected by COVID-19 infection compared to doctors who did not use infection control measures, which was statistically significant ($p < 0.05$). The likelihood of not being affected by COVID is 8.6256 (CI: 5,1419–14.4695) times higher for those who use the required chemicals for disinfection compared to those who do not use the required chemicals for disinfection. Whereas active screening for fever and COVID-19 symptoms, RT PCR testing for patients (Table 2).

From the table above, we can clearly say that there were only two major significant predictors for the COVID status in the model. The likelihood of not being positive for COVID is 4.8542 times higher for subjects who used chemicals for disinfection compared to oral and maxillofacial surgeons who did not use chemicals for disinfection. The likelihood of not being positive for COVID-19 is 14.8505 times for surgeons who used fumigation system (Table 3).

DISCUSSION

Infection control especially COVID-19 in the present pandemic situation continues to be one of the most critical issue in health care services worldwide. Transmission of infection during dental procedures may occur through direct contact with bodily fluids or via indirect contact with objects like instruments or environment surfaces.^{1,2,4} So, there is a need to present and control infection to provide secure environment for health care professionals in general and more specifically for oral and maxillofacial surgeons.^{9,11,12}

In the present study, it was seen that infection control measures were practiced more by the oral and maxillofacial surgeons working in government hospital when compared to private hospitals (Table 4). Compliance with effective infection control practices may be affected by several factors such as knowledge, cost, lack

of incentives, and availability of and access to required materials and equipment.¹³⁻¹⁵ The present study was done before the advent of vaccine. Although in current situation where we have COVID-19 vaccine, unfortunately as SAR-COV2 keeps changing its behavior, the apprehension still remains among the oral surgeons to deliver the care to the patients. Hence the present study highlights the importance of infection control measures in controlling COVID-19. The findings of this study will help us to provide practical advice to oral surgeons regarding appropriate use of infection control measures to protect themselves from the risk of COVID-19 infection during surgical procedures.

In our study, 114 (32.29%) of oral surgeons were COVID-19 positive. This high prevalence of infection among our study participants could be due the inappropriate use of one or the other infection control measures but also may be due to their exposure to COVID patients outside their clinical practice. In this study it was observed that in spite of recording body temperature, use of PPE, use of N 95 masks, use of dental chair water unit, use of Hand pieces and use of UV light for major and minor surgical procedures, majority of the surgeons tested COVID positive. This observation can be due to improper fit of N 95 masks, non-adherence of proper donning, doffing and use of protocols which is essential for the success of disease prevention among the surgeons. It was seen that oral and maxillofacial surgeons who practiced with adequate infection control measures were less likely to be affected by COVID-19 than those who did not practiced infection control measures (Tables 2 and 3). Similarly, in a study conducted in United States showed dentists who practiced infection control measures were less likely to get COVID-19.^{14,16}

In the present study use of chemicals for disinfection and use of fumigation system were the predictors of COVID-19 status among oral surgeons (Table 3). A systematic review conducted on environmental disinfection of a dental clinic during the COVID-19 pandemic showed that using environmental disinfection is protective. Similar results were found in a study conducted in turkey.^{12,17,18}

In this study, various barriers to use infection control measures were identified like cost of equipment, the willingness of patients to pay for various measures, difficulty in procuring the equipment's. Similarly, a study conducted on the implementation of COVID-19 infection control measures by German dentists showed that major barriers were lack of knowledge, guidelines, and recommendation as well as limited availability and high costs of equipment's.¹⁹

Table 3: Logistic regression model for predictors of COVID-19 status among oral and maxillofacial surgeons

	Estimate	Std. Error	z value	p-value	OR (CI)
(Intercept)	-1.2024	0.2201	-5.462	<0.0001*	0.3005 (0.192, 0.4565)
Chemicals required					
No (Reference)					
Yes	1.5798	0.3059	5.164	<0.0001*	4.8542 (2.6839, 8.9385)
Fumigation systems					
No (Reference)					
Yes	2.698	0.3241	8.325	<0.0001*	14.8505 (8.041, 28.8145)

Table 4: Distribution of study participants according to Barriers for Infection control measures

Barriers	Yes	No
Cost effective	202 (57.22%)	151 (42.78%)
Patient not willing to pay for PPE's essentials	202 (57.22%)	151 (42.78%)
Difficulty in procuring	0 (0%)	353 (100%)
Difficulty in performing the procedure with PPE's	251 (71.1%)	102 (28.9%)



CONCLUSION

The dental health care professionals especially oral and maxillofacial surgeons are potentially at risk of exposure to COVID-19. The finding of this study has highlighted the need for infection control measures.

- This study shows that majority of infection control measures were practiced more in government hospitals when compared to private hospitals.
- This study highlights that oral and maxillofacial surgeon practicing infection control measures like use of prophylactic medication, high volume extra oral suction, negative pressure room, use of HEPA filters, fumigation system, and use of chemicals for disinfection were less likely to be affected by COVID-19.
- In this study, it was observed that in spite of recording body temperature, use of PPE, use of N 95 masks, use of dental chair water unit, use of Hand pieces and use of UV light for major and minor surgical procedures, majority of the surgeons tested COVID positive.
- The common barriers to adopt infection control measures were cost, willingness of patient, difficulty in procuring and difficulty in performing the procedures using PPE.

Recommendations

- Regardless of whether the health care professionals acquire infection at workplace or community, it is essential to practice appropriate infection control measures like use of personal protective equipment, sterile instruments and devices, clean and disinfected environmental surfaces.
- Adequate information regarding basis infection control measures should be provided to oral and maxillofacial surgeons through continuing education programs by dental association and government agencies.

Limitations

The study relies on self-reported information and might therefore represent overestimation of practices of infection control measures. The association of COVID positive status among the oral surgeons cannot be completely associated with their inappropriate use of infection control measures solely, but may be due to their exposure to COVID patients outside their clinical practice also.

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QUESTIONNAIRE

1. Name: _____
2. Age: _____
3. Zone/state of practice: _____
4. Where do you work
 - Private setup
 - Government setup
5. Which of the following measures you have adapted to combat the COVID 19 Situation
 - Use of prophylactic medication
 - Screening of patient: History
 - Body Temperature
 - Blood COVID testing
 - Use of Appropriate PPE and face shield
 - Use of N 95 masks

- Fumigation systems
- High volume extra oral suction
- The indoor air cleaning system
- The dental chair water lines should be equipped with ant retraction valves n valves
- Used hand pieces with anti-retraction valves only
- Chemicals required for disinfection
- Heap filters
- UG light
- Natural ventilation
- Negative pressure room
- Any others:_____
6. Have you treated any COVID positive patient
- Yes
- No
7. Have you been tested positive for COVID 19
- Yes
- No
8. Did you develop the symptoms
- Yes
- No
9. What are the barriers in adapting the protocols
- Cost effective
 - Patient not willing to pay for PPE's
 - Difficulty in procuring
 - Difficulty in performing the procedure