

# A study on the severity and prevention measures of COVID-19 among dental professionals in clinical practice management

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## Abstract.

**BACKGROUND:** Medical professionals, especially dental professionals, have been adversely affected by the pandemic of COVID-19 due to an increased chance of exposure to patients because of close contact during treatments.

**OBJECTIVES:** This study aimed to evaluate knowledge about the disease and assess ways of precautions to be taken during the pandemic.

**METHODS:** A questionnaire was developed and registered at Google Forms. The study population included dental practitioners, working in hospitals and clinics. A total of 495 dental practitioners from 14 different countries across the world responded. Most dentists were aware of the required modifications in the management of patients. The points allotted for each correct/best answer by participants for a group of questions regarding each component (Knowledge, Perceptions, and Practices) were added/summed to generate an overall score for each of the three components.

**RESULTS:** Both univariate and multivariate analysis employed for the evaluation of results. Moreover, the total practice score was significantly associated with gender and sector of practice. Multivariable analysis model using multiple linear

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35 regressions was formulated by including those variables which were significant at the univariate stage. Hence, the practice  
36 sector was the only variable found to be significantly associated with the total knowledge score ( $p$ -value  $< 0.05$ ). Conclusion:  
37 This study, based on our experience and relevant guidelines and research, introduces essential knowledge about COVID-19  
38 and infection in dental settings.

39 Keywords: Awareness, pandemic, hygiene practice, infection control, coronavirus

## 35 1. Introduction

36 The rapidly climbing outbreak of COVID-19  
37 caused by severe acute respiratory syndrome Cor-  
38 onavirus-2 (SARS-CoV-2) exhibits a serious global  
39 concern that is affecting general health of medi-  
40 cal professional, overall healthcare systems, and the  
41 global economy. The first patient with pneumonia  
42 of an unknown cause that resembled viral pneumo-  
43 nia was reported in Wuhan, China on December 31,  
44 2019 [1]. This pneumonia was a result of sec-  
45 ondary pulmonary infection, attributed to 2019 novel  
46 Coronavirus (2019-nCoV) [2] and officially termed  
47 SARSCoV-2 [3]. As the COVID-19 outbreak pro-  
48 gressed rapidly across the world, the World Health  
49 Organization (WHO) declared a global pandemic on  
50 March 11, 2020. COVID-19 has affected more than  
51 164 million people globally with over 3 412 032 con-  
52 firmed deaths in about 216 countries and territories  
53 as of May 21, 2021, therefore posing a serious and  
54 alarming public health concern [4]. Strict measures  
55 are being extensively undertaken to mitigate the com-  
56 munity transmission of COVID-19 through social  
57 distancing, quarantines, lockdowns, travel restrictio-  
58 ons, and the requisite of wearing facemasks in  
59 public [5].

60 The transmission patterns of SARS-CoV-2 pro-  
61 pose that respiratory droplets and direct contact are  
62 the main routes of transmission [6]. With this con-  
63 cept, the possibility of aerosol transmission in a  
64 closed environment with high concentrations of vital  
65 aerosols is possible [7]. This type of transmission  
66 constitutes a special implication to dentistry as many  
67 dental procedures and tools used can induce or gener-  
68 ate contaminated aerosols with the potential to cause  
69 infection [8]. Dental offices can act as focal spots  
70 of cross-contamination and can lead to nosocomial  
71 COVID-19 transmission to both patients and dental  
72 staff. In fact, a clinical study found that the human-to  
73 human hospital related COVID-19 transmission was  
74 41.3%, 29% of which occurred in healthcare workers  
75 [9]. Healthcare workers, including dentists and dental  
76 staff, who are on the frontline, battling the COVID- 19  
77 pandemic, face an increase in the risk of contracting

and transmitting the infection while delivering dental  
services [10].

COVID-19, which is a highly contagious disease,  
constitutes a major threat to the health of dentists,  
their assistants, and patients [11]. There are practical  
guidelines recommended for dentists and dental staff  
by the Centers for Disease Control and Prevention  
(CDC), the American Dental Association (ADA), the  
World Health Organization and country wise their  
own association's guidelines are also available to con-  
trol the spread of COVID-19 [8–10]. These guidelines  
could contribute, at a population level, in disease  
control and prevention. Therefore, dentists should  
have knowledge and awareness of the most effec-  
tive preventive measures to protect themselves and  
their patients' health [12]. Given their crucial role in  
fighting the pandemic, we aimed this study to assess  
the knowledge, perceptions, and practices of den-  
tists regarding the COVID-19 pandemic in different  
countries.

## 2. Materials and methods

This cross-sectional study was conducted by a que-  
stionnaire consisting of open and close-ended ques-  
tions in English language created on Google Forms,  
shared via social media platforms such as WhatsApp  
and Facebook, to dental professionals worldwide.  
The study was conducted from 1 June to 31 August,  
2020 in 14 different countries and regions. Questions  
were about demographics, perceptions of COVID-  
19, and practice modifications incorporated in the  
current pandemic or to combat the spread of COVID-  
19. Demographic questions included age, gender,  
location, designation, experience in dentistry, and  
sector of practice. The second section of the ques-  
tionnaire was regarding the perception of COVID-19  
among dental surgeons. The last section of the ques-  
tionnaire comprised of questions related to practice  
modifications during the pandemic. The form used in  
the current study gathered data objectively and vali-  
dated through the univariate analysis of independent

variables, while multivariate analysis was done for dependent variables. Any inadequately filled questionnaires were not included in the results of the study. A total of 495 valid respondents of the questionnaire were found after a week of publishing the survey. The participants are from different countries in the south and middle Asia namely, Saudi Arabia, UAE, Pakistan, India, and from other parts of the world.

### 2.1. Statistical analysis

The points allotted for each correct/best answer by participants for a group of questions regarding each component (Knowledge, Perceptions, and Practices) were added/summed to generate an overall score for each of the three components. Mean, standard deviation, and medians were calculated for the overall scores. Frequencies were calculated for categorical variables. Multiple linear regression was used to assess the association of independent variables with the outcome variable, i.e., scores of all three components. A  $p$ -value of  $<0.05$  was considered to be significant.

## 3. Results

### 3.1. Univariate analysis

The univariate analysis results showed that there was a statistically significant association of age, level of practice, and sector of practice with the total knowledge score of participants. Moreover, the total practice score was significantly associated with gender and sector of practice. None of the independent variables was found to be significantly related to total perception scores, given in Table 1.

### 3.2. Multivariable analysis

Multivariable analysis model using multiple linear regression was formulated by including those variables, which were significant at the univariate stage. Hence, the practice sector was the only variable found to be significantly associated with the total knowledge score ( $p$ -value  $<0.05$ ). This infers that estimated mean knowledge scores of dental professionals had an overall decreasing relationship with the sector of practice, showing that those working in the

Table 1

Univariate analysis for the association of dental professionals' COVID-19 knowledge, perceptions and practices with independent variables

Independent variables		n (%)	Knowledge		Perceptions		Practice	
			Mean total score (+/-SD)	$p$ value <sup>#</sup>	Mean total score (+/-SD)	$p$ -value <sup>#</sup>	Mean total score (+/-SD)	$p$ -value <sup>#</sup>
Age	20–30	317 (64.0)	14.4 (+/-2.79)	0.004	5.3 (+/-2.3)	0.41	9.3 (+/-1.5)	0.26
	31–40	135 (27.3)	14.9 (+/-2.49)		5.2 (+/-2.2)		9.5 (+/-1.6)	
	>40	43 (8.7)	15.8 (+/-2.92)		5.7 (+/-2.6)		9.7 (+/-1.7)	
		495 (100)						
Gender	Female	253 (51.1)	14.7 (+/-2.6)	0.77	5.1 (+/-2.3)	0.13	9.6 (+/-1.5)	0.003
	Male	242 (48.9)	14.6 (+/-2.9)		5.4 (+/-2.2)		9.2 (+/-1.6)	
		495 (100)						
Level of practice	General Dentist	328 (66.2)	14.5 (+/-2.75)	0.05	5.2 (+/-2.3)	0.89	9.3 (+/-1.5)	0.36
	Post graduate Resident	89 (18.0)	15.1 (+/-2.6)		5.3 (+/-2.1)		9.5 (+/-1.7)	
	Specialist	78 (15.8)	15.2 (+/-2.8)		5.4 (+/-2.3)		9.6 (+/-1.6)	
		495 (100)						
Sector of practice	Government	142 (28.7)	14.9 (+/- 2.4)	0.0008	5.1 (+/-2.2)	0.23	9.6 (+/-1.3)	0.03
	Private	217 (43.8)	14.4 (+/- 2.8)		5.3 (+/-2.3)		9.2 (+/-1.7)	
	Semi private	63 (12.7)	14.1 (+/-2.6)		5.1 (+/-2.2)		9.6 (+/-1.8)	
	Both Govt & Pvt	73 (14.8)	15.7 (+/-2.9)		5.7 (+/-2.5)		9.3 (+/-1.2)	
		495 (100)						
Years of experience	<2 years	82 (16.6)	14.3 (+/-2.8)	0.13	5.3 (+/-2.2)	0.97	9.4 (+/-1.6)	0.89
	2–5 years	134 (27.0)	14.5 (+/-2.6)		5.2 (+/-2.3)		9.3 (+/-1.7)	
	>5 to 10 years	135 (27.3)	14.6 (+/-2.8)		5.3 (+/-2.4)		9.4 (+/-1.3)	
	>10 years	144 (29.1)	15.1 (+/-2.8)		5.3 (+/-2.3)		9.3 (+/-1.5)	
		495 (100)						

<sup>#</sup> Simple linear regression. Overall total mean knowledge score ( $n = 495$ ) = 14.7 (+/-2.7), median = 15, range = 7 to 21. Overall total mean perceptions score ( $n = 495$ ) = 5.3 (+/-2.3), median = 5, range = 1 to 11. Overall total mean practices score ( $n = 495$ ) = 9.4 (+/- 1.5), median = 9.5, range = 4 to 12.

Table 2  
Multivariable analysis for the association of dental professionals' COVID-19 knowledge, perception and practices with independent variables

Independent variables		Knowledge			Perceptions			Practices		
		B coefficient (95% CI)	Standard error	P value <sup>#</sup>	B coefficient (95% CI)	Standard error	P value <sup>#</sup>	B coefficient (95% CI)	Standard error	P value <sup>#</sup>
Age	31–40	0.45 (–0.095, 0.994)	0.28	NS**	–0.08 (–0.54, 0.38)	0.23	NS*	0.16 (–0.15, 0.47)	0.16	NS*
	>40	1.43 (0.56, 2.29)	0.44		0.45 (–0.28, 1.18)	0.37		0.37 (–0.13, 0.86)	0.25	
Gender	21–30	Reference			Reference			Reference		
	Male	–0.07 (–0.56, 0.41)	0.25	NS*	0.31 (–0.09, 0.72)	0.21	NS*	–0.37 (–0.65, –0.09)	0.14	0.01
Level of practice	Female	Reference			Reference			Reference		
	Post graduate resident	0.61 (–0.04, 1.24)	0.33	NS**	0.04 (–0.50, 0.58)	0.27	NS*	0.14 (–0.22, 0.51)	0.18	NS*
	Specialist	0.69 (0.01, 1.40)	0.34		0.14 (–0.43, 0.70)	0.29		0.26 (–0.12, 0.64)	0.19	
Sector of practice	General dentist	Reference			Reference			Reference		
	Government	–0.92 (–1.68, –0.15)	0.39	0.02	–0.66 (–1.31, –0.02)	0.33	NS*	0.21 (–0.23, 0.65)	0.23	NS**
	Private	–1.34 (–2.05, –0.63)	0.36	<0.001	–0.43 (–1.04, 0.17)	0.31		–0.20 (–0.61, 0.21)	0.21	
	Semi private	–1.66 (–2.57, –0.75)	0.46	<0.001	–0.59 (–1.36, 0.18)	0.39		0.18 (–0.35, 0.71)	0.27	
Years of experience	Both govt and pvt	Reference			Reference			Reference		
	2–5 years	0.26 (–0.49, 1.01)	0.38	NS*	–0.12 (–0.75, 0.51)	0.32	NS*	–0.13 (–0.55, 0.29)	0.22	NS*
	>5 to 10 years	0.36 (–0.39, 1.11)	0.38		–0.08 (–0.71, 0.55)	0.32		–0.0006 (–0.43, 0.42)	0.22	
	>10 years	0.83 (–0.09, 1.57)	0.38		–0.01 (–0.64, 0.61)	0.32		–0.09 (–0.51, 0.33)	0.21	
	<2 years	Reference			Reference			Reference		

\*Not significant (NS) at univariate analysis stage. \*\*Not significant (NS) at multivariable analysis stage. # Multiple linear regression.

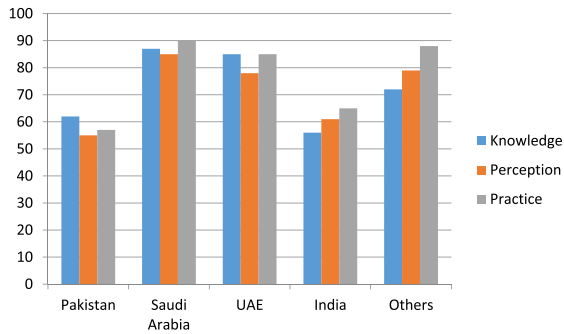


Fig. 1. Country-wise data on knowledge, perception and practice.

government sector (B-coefficient =  $-0.92$ ) scored significantly better on knowledge assessment than those working in the private sector (B-coefficient =  $-1.34$ ) and semi-private sector (B-coefficient =  $-1.66$ ). Similarly, multivariable linear regression modeling for total practice scores revealed that estimated mean practices score decreases for males by 0.37 units compared to females ( $p$ -value  $< 0.05$ ), given in Table 2.

Each country had the different number of participants involved and country-wise data on knowledge, perception and practice is shown in Fig. 1. The dentists had mean score of knowledge regarding disinfection, viability of virus on different surfaces, and proper protective equipment ( $n = 495$ ) = 14.7 ( $+/-2.7$ ) for univariate analysis and 0.69 ( $+/-0.39$ ) for multivariable analysis ( $n = 495$ ). Thirty six dentists scored a total of 6 out of 10 with only 16 dentists scored  $< 6$ . Most of the dental practitioners had good knowledge about symptomatology of COVID-19 and the prevention of infection.

The majority of dentists had perceived COVID-19 as very threatening, and the mean perception score ( $n = 495$ ) = 5.3 ( $+/-2.3$ ) for univariate analysis and ( $n = 495$ ) = 0.69 ( $+/-0.39$ ) for multivariable analysis. Most of the dental practitioners reported that COVID-19 is a major global health problem and believed that public awareness is necessary regarding COVID-19 to prevent the transmission of the virus.

Several dentists shared that COVID-19 symptoms often resolved with time and do not required any special management. The mean practices score was ( $n = 495$ ) = 9.4 ( $+/-1.5$ ) for univariate analysis and ( $n = 495$ ) = 0.69 ( $+/-0.39$ ) for multivariable analysis. Concerning dentists' preventive measures in their setup, most of them reported that it was essential to ask patients to maintain a social distance of minimum 2 m from each other, wear masks in the waiting area, and wash hands before getting into the dental unit

to reduce the virus spread, even 24 (11.7%) reported that this was not required and may exhibited panic.

#### 4. Discussion

As this disease was first reported at the end of 2019, most healthcare workers, especially dental professionals, were unaware of the disease's signs and symptoms [13]. This study described the knowledge, perceptions, practice modifications, and anxiety of getting exposed among the dental community while at work during this pandemic situation. For this reason, a questionnaire comprising of questions (closed-ended) was administered to collect information about knowledge of this disease, perception, and any modifications during practice to fight the COVID-19 pandemic. Studies based on the questionnaire are recognized for collecting information about contestants' knowledge, perceptions, attitude, and practices. Still, vigilant collection of data and clarification is required [14].

Our univariate and multivariate analysis revealed that it was related to better knowledge, perception, and infection control. Results from other studies reported no association with age [15, 16]. First, this small difference in results may be partly related to the difference in the questions used to assess dentists' knowledge. Second, we think that the young dentists were more knowledgeable than older ones because given the lack of latest guidelines for dentists locally available, younger dentists who are more familiar with online learning have consulted the international guidelines that have been published on the international health institutions websites earlier since the start of the pandemic [17].

Our study showed that dentists adopt high level of prevention measures in dental clinics during the pandemic including hand hygiene, surface disinfection, use of personal protective equipment (PPE) and taking patient's temperature as a part of the triage process. Our univariate and multivariate analysis reported that good knowledge was related with having high prevention measures index [18].

The differences between regions reflect the timeline in regional outbreaks and the speed with which countries responded to COVID-19. Some countries were better prepared because their healthcare system is well organized according to WHO health care index [19, 20] and as they experienced outbreaks in the past; the SARS in Southeast Asia and the West Pacific

in2003, [21] and MERS in 2012 in the EMRO region. [22]. The outbreak of the disease in Pakistan alerted health authorities to the seriousness of the disease, leading to immediate suspension of elective dental treatment and confining treatment to emergency care, with subsequent financial impact on dentists [23].

Most of the dentists in the present study had a good perception and positive attitude towards infection control practices, similar to Peng et al.'s [24] findings in China, where 73.8% of their subjects demonstrated positive attitudes. This is crucial, as the current approach to COVID-19 is to control the routes of infection and to conduct extensive infection prevention and control (IPC) trainings with preventive measures to lower the risk of transmission [24].

Furthermore, extra-oral radiographs such as OPG (orthopantomogram) and CT scan (cone beam computed tomography) should be employed to reduce the disease spread among dental auxiliaries. The ultrasonic scaling device must be replaced with hand cures marking to minimize aerosols' spread and production. Globally, all regulating dental associations such as the ADA are recommending dental professionals to operate only emergency dental procedures [25].

Limitations included recall and information bias related to the use of an online self-administered questionnaire was used as survey instrument. The exponential increase in COVID-19 cases in different countries throughout the period of the survey and the frequency in which guidelines and recommendations were published may have contributed to different responses from the same country and region.

## 5. Conclusions

As information about COVID-19 continues to evolve rapidly, further improvement and update would be beneficial to optimally manage patients in this challenging situation. This study determined that majority of dentists had adequate knowledge, perceptions, and practices of COVID-19. The dentists however had a good perception and positive attitude towards infection control practices against COVID-19. Our recommendations are that it is important for dental healthcare professionals to adhere to the strictest protocols and the highest quality standards of care consistently while providing services for patients in a safe environment.

## Conflict of Interest

The authors declare no conflict of interest.

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