Assessing Knowledge, Attitudes and Practices of dental practitioners regarding the COVID-19 pandemic: A multinational study

Ocena wiedzy, zachowań i działań praktycznych u lekarzy dentystów w związku z pandemią COVID-19 – wielonarodowe badanie ankietowe

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Abstract

Background. Coronavirus Disease 2019 (COVID-19) has been declared a global public health emergency that is affecting people across the globe.

Objectives. The aim of this study was to assess the Knowledge, Attitudes and Practices (KAP) of dental practitioners regarding the Coronavirus Disease 2019 (COVID-2019) pandemic.

Material and methods. An online questionnaire was distributed among dentists across the globe using a combination of convenience and snowball sampling. The questionnaire was divided into 4 sections: the 1st one contained personal information, whereas the 2nd, 3rd and 4th sections assessed knowledge (11 questions), attitudes (6 questions) and practices (7 questions) of the dentists. The data was subjected to the Shapiro–Wilk test, one-way analysis of variance (ANOVA), multivariate linear regression, and Pearson's correlation; 95% confidence interval (CI) was calculated and odds ratio (OR) was obtained. The analysis was done using IBM SPSS for Windows, v. 21.0.

Results. The total number of the responses received (860) was divided with regard to various continents (Asia, Americas – North and South, Europe, Africa, and other – Australia and Antarctica). The largest number of dentists came from the Asian continent (264; 30.7%). Most dentists had a degree of MDS (Master of Dental Science) (301; 35.0%), followed by BDS (Bachelor of Dental Surgery) (282; 32.8%) and DDS (Doctor of Dental Surgery) (226; 26.3%). High/Good knowledge and practice scores were observed among 92.7% and 79.5 % of the dentists, respectively. Good knowledge scores were significantly associated with qualifications ($p = 0.04$) and years of practice ($p = 0.02$); good practice scores were associated with qualifications only ($p = 0.03$).

Conclusions. The dentists were found to have good knowledge and practice scores, which is important to combat COVID-19. They are advised to follow the Centers of Disease Control and Prevention (CDC) and World Health Organization (WHO) guidelines in their clinics, and sensitize their staff so that no stone is left unturned in defeating this pandemic.

Key words: dentists, COVID-19, pandemic

Słowa kluczowe: dentyści, COVID-19, pandemia

Introduction

At the dawn of a new decade, on 30th January, 2019, the World Health Organization (WHO) declared a global public health emergency against the outbreak of coronavirus disease, which is termed as Coronavirus Disease 2019 (COVID-19), and since then has rapidly achieved a pandemic status. This disease with flu-like symptoms was initially observed among people residing in Wuhan, Hubei Province in China.[1]

The causative organism responsible for this outbreak – the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) – belongs to the family *Coronaviridae* of the order *Nidovirales.* This virus structurally comprises of a large, single, plus-stranded RNA as its genome.[2,3] A total of 4 genera of coronaviruses have been discovered to date and these are: α- CoV, β-CoV, γ-CoV, and δ-CoV.[4] The α-CoV and β-CoV variants are observed to infect mainly the respiratory, gastrointestinal and central nervous system of humans and/or mammals, whereas γ-CoV and δ-CoV have been reported with reference to the infections limited to bird species.[5]

Humans suffering from this disease clinically present with the primary symptoms of fever, cough, myalgia or fatigue, abnormal chest computed tomography (CT) image, and severe respiratory distress, whereas less common symptoms include sputum production, headache, hemoptysis, and diarrhea.[3,6,7] Initially, it was considered to have a zoonotic route of transmission; however, a new person-to-person route of transmission is causing the disease to spread rapidly across different continents and is more likely to affect elderly males.[3,8]

Environmental contamination has been singled out as the primary factor for the nosocomial spread of the newest strains of viruses.[9,10] With regard to SARS-CoV-2, researchers have confirmed its nosocomial transmission, although very little is known about its mode of transmission and the extent of environmental contamination.[11] In a dental setting, as the dentist and their equipment are in close proximity to the patient, the chance of acquiring infection from the micro-droplets of an infected patient is high and there is a risk of cross-transmission, too.

In developing and tourist-friendly countries, there is a boom of dental tourism due to the availability of quality treatment at affordable prices, which attracts patients from all over the world.[12] In the event of an outbreak, the dentist can be the first person to come in contact with an infected person; they can either unknowingly become a carrier and infect others or by following proper guidelines can prevent the possible spread of the disease and save the entire community from its disastrous consequences. Dentists who specialize in the field of public health dentistry are at an increased risk of contacting such an infection due to the nature of their work, which involves promoting oral health among their communities with limited resources.

To combat an outbreak, dentists should be aware of recent developments, especially those related to public health, and by following apt guidelines (i.e., the WHO guidelines at https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance) make efforts to prevent the transmission of such diseases. Hence, the present study was undertaken with the aim to assess the Knowledge, Attitudes and Practices (KAP) of dental practitioners regarding the COVID-2019 pandemic.

Material and methods

Prior to the implementation of this KAP study, the questionnaire design, validation, pilot study, and strategies to enroll dentists for maximal global participation were discussed. This study was approved by the Institutional Ethics Committee of the Institute of Dental Sciences (IDS) in Bareilly, India (No. IEC/57/2019). The main instrument to collect data was an online questionnaire using Google forms and it is available at: https://forms.gle/5sgxWngughJg23K46. Upon clicking on the link, the 1st page assured the confidentiality of data, informed the dentists of the study objectives and stated that the study participation was purely voluntary. The dentists' consent to participate in the study (inclusion criteria) was implied when they clicked on the 'next' button to answer the questionnaire, and they had complete freedom either to decline or answer the questionnaire. Only the principal investigator had access to the data and no personal details (e-mail address, phone number, name, etc.) were required. Responses were sought from only those dentists who at least had completed their graduation in dentistry and a submission was considered only when the 'submit' button was clicked at the end of the questionnaire (inclusion criteria). Among total submissions, if a dentist failed to answer ≥1 question, it was excluded from the analysis (Fig. 1).

The study duration was from 25th December, 2019 to 20th February, 2020, and both convenience sampling (researchers themselves contacted dentists to participate in the study) and snowball sampling (the participating dentists were asked to forward the questionnaire to their colleagues) were used so that maximal participation could be ensured. The questionnaire was distributed personally via a quick response (QR) code as well as posted on various social media platforms like Facebook and WhatsApp. The questionnaire was divided into 4 sections and had a total of 24 questions. The 1st section contained personal information (continent of residence, highest qualification, currently practicing as (an academician, clinician, or both), and years of practice), whereas the 2nd, 3rd and 4th sections assessed the knowledge (11 questions), attitudes (6 questions) and practices (7 questions) of the dentists regarding COVID-19. A pilot study was done on 25 dentists to validate the questionnaire and its Cronbach's alpha (α) was found to be 0.79. The pilot study responses and incomplete responses were excluded from the main analysis.
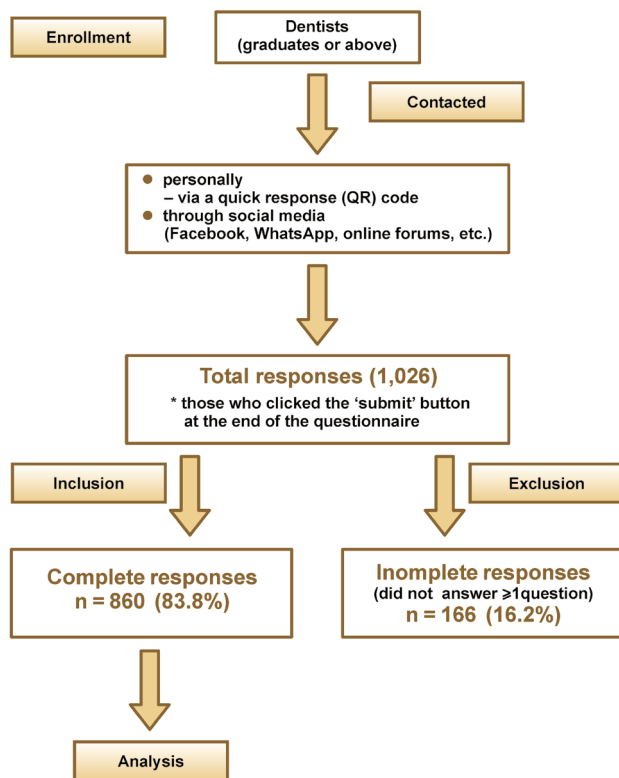
Fig. 1. Study protocol

The data analysis included the Shapiro–Wilk test (to check the data for normality), one-way analysis of variance (ANOVA), multivariate linear regression, and Pearson's correlation coefficient; 95% confidence interval (CI) was calculated and odds ratio (OR) was obtained. The coded data was sent to the statistician so that the confidentially of the data could be maintained. The analysis was done using IBM SPSS for Windows, v. 21.0 (IBM Corp., Armonk, USA).[13]

Results

A total of 1,026 submissions were recorded, among which 860 were complete responses and were included in the analysis (response rate: 83.8%).

Socio-demographic characteristics of the participating dentists

Since the present study adopted a global approach, the total number of the responses received (860) was divided with regard to various continents (Asia, Americas – North and South, Europe, Africa, and other – Australia and Antarctica), with the largest number of dentists coming from the Asian continent (30.7%) and the fewest responses from 'other' continents (5.4%). Most dentists had a degree of MDS (Master of Dental Science) (35.0%), followed by BDS (Bachelor of Dental Surgery)

(32.8%) and DDS (Doctor of Dental Surgery) (26.3%). The majority of them were clinicians (65.0%) and an experience period of 2–5 years was mostly reported (34.5%) (Table 1).

Responses to the questionnaire and the source of information regarding COVID-19

The source of information regarding COVID-19 was primarily the Internet (37.7%), followed by social media sites (30.9%), television (20%), newspapers (10%), and other (1.4%) (Table 2).

Knowledge regarding COVID-19

Almost all (99.4%) of the dentists heard about the coronavirus, whereas only 90.9% could name it correctly. A total of 98.4% of the dentists could identify the epicentre; 68.1% and 64.2% of the dentists, respectively, knew about vaccine availability and the method of diagnosing the disease. A total of 95.9% of the dentists believed that COVID-19 was fatal in nature and 99.8% reported that wearing mouth masks could prevent its transmission. Significant differences were observed when the dentists responded to questions regarding the affected system ($p = 0.011$) and the fatality of COVID-19 ($p = 0.023$) (Table 2).

Table 1. Sociodemographic characteristics of the participating dentists

Characteristic		n (%)
Continent of residence	Asia	264 (30.7)
	Americas (North and South)	215 (25.0)
	Europe	140 (16.3)
	Africa	194 (22.6)
	other (Australia and Antarctica)	47 (5.4)
Highest qualification	PhD	14 (1.6)
	MDS	301 (35.0)
	DDS	226 (26.3)
	DMD	37 (4.3)
	BDS	282 (32.8)
	other	–
Currently practicing as	an academician	202 (23.5)
	a clinician	559 (65.0)
	both	99 (11.5)
Years of practice	0–2	216 (25.1)
	2–5	297 (34.5)
	5–10	199 (23.1)
	>10	45 (5.3)
	currently not practicing	103 (12.0)

PhD – Doctor of Philosophy; MDS – Master of Dental Science; DDS – Doctor of Dental Surgery; DMD – Doctor of Dental Medicine; BDS – Bachelor of Dental Surgery.

Percentages rounded off to the nearest decimal.

Table 2. Responses to the questionnaire by the participating dentists

	Questionnaire item (serial No.)	Overall N = 860	Asia (264)	Americas (215)	Europe (140)	Africa (194)	Other continents (47)	p-value
Knowledge	heard about the coronavirus	855 (99.4)	263 (99.6)	215 (100)	140 (100)	190 (97.9)	47 (100)	NS
	could name it correctly	782 (90.9)	232 (87.9)	210 (97.7)	137 (97.9)	163 (84.0)	40 (85.1)	NS
	could correctly identify – place where COVID-19 was first diagnosed – affected system – transmission route – signs and symptoms	846 (98.4) 736 (85.6) 839 (97.6) 850 (98.8)	260 (98.5) 201 (76.1) 261 (98.9) 260 (98.5)	213 (99.1) 205 (95.3) 211 (98.1) 212 (98.6)	140 (100) 126 (90.0) 138 (98.6) 139 (99.3)	189 (97.4) 165 (85.0) 189 (97.4) 193 (99.5)	44 (93.6) 39 (83.0) 40 (85.1) 46 (97.9)	NS 0.011* NS NS
	knew about – vaccine availability – mode of spreading – protection from mouth masks – method of diagnosing – fatality of the disease	586 (68.1) 829 (96.4) 858 (99.8) 552 (64.2) 825 (95.9)	154 (58.3) 260 (98.5) 263 (99.6) 145 (54.9) 257 (97.3)	175 (81.4) 206 (95.8) 215 (100) 154 (71.6) 205 (95.3)	101 (72.1) 136 (97.1) 140 (100) 126 (90.0) 132 (94.3)	121 (62.4) 189 (97.4) 194 (100) 103 (53.1) 191 (98.5)	35 (74.5) 38 (80.9) 46 (97.9) 24 (51.1) 40 (85.1)	NS NS NS NS 0.023*
Attitudes	possible – to spread awareness regarding COVID-19 by the dentists – COVID-19 becoming a pandemic – effectiveness of hand hygiene and PPE in preventing infection	860 (100) 750 (87.2) 860 (100)	264 (100) 239 (90.5) 264 (100)	215 (100) 211 (98.1) 215 (100)	140 (100) 124 (88.6) 140 (100)	194 (100) 144 (74.2) 194 (100)	47 (100) 32 (68.1) 47 (100)	NS NS NS
	risk – avoiding non-vegetarian food due to COVID-19 – to their health – to the patients' health	310 (36.0) 563 (65.5) 776 (90.2)	158 (59.8) 199 (75.4) 251 (95.1)	65 (30.2) 101 (47.0) 189 (87.9)	29 (20.7) 124 (88.6) 121 (86.4)	46 (23.7) 111 (57.2) 174 (89.7)	12 (25.5) 28 (59.6) 41 (87.2)	0.049* NS NS
Practices	– staff sensitized as per the WHO guidelines for the prevention of COVID-19	377 (43.8)	88 (33.3)	126 (58.6)	47 (33.6)	102 (52.6)	14 (29.8)	NS
	– included the travel history while recording the patients' histories	827 (96.2)	261 (99.0)	209 (97.2)	132 (94.3)	183 (94.3)	42 (89.4)	0.025*
	– discussed the risk of COVID-19 with the patients	589 (68.5)	147 (55.7)	212 (98.6)	100 (71.4)	99 (51.0)	31 (66.0)	NS
	– discussed preventive measures against COVID-19 with the patients	679 (79.0)	244 (92.4)	200 (93.0)	83 (59.3)	125 (64.4)	27 (57.4)	NS
	– took action to show the patients the signs and symptoms of COVID-19	275 (32.0)	56 (21.2)	84 (39.1)	26 (18.6)	87 (44.8)	22 (46.8)	NS
	– took preventive measures against COVID-19 – Has COVID-19 affected your social life?	853 (99.2) 224 (26.0)	263 (99.6) 57 (21.6)	215 (100) 16 (7.4)	140 (100) 64 (45.7)	188 (96.9) 78 (40.2)	47 (100) 9 (19.1)	NS 0.036*
Primary source of information regarding COVID-19	newspapers	86 (10.0)						
	television	172 (20.0)						
	the Internet	325 (37.7)			–			NA
	social media	265 (30.9)						
	other	12 (1.4)						

COVID-19 – Coronavirus Disease 2019; PPE – personal protective equipment; WHO – World Health Organization; NS – nonsignificant; NA – not applicable; * statistically significant (p < 0.05).
Data presented as number (percentage); percentages rounded off to the nearest decimal.

Attitudes regarding COVID-19

All dentists (100%) agreed that it was possible for dentists to spread awareness regarding COVID-19, and that hand hygiene and personal protective equipment (PPE) were highly effective in preventing infection. A total of 87.2% of the dentists believed that COVID-19 could achieve a pandemic status; 65.5% responded that it was a risk to their own health, whereas 90.2% believed that it was a risk to their patients' health. Non-vegetarian food was being avoided by 36% of the dentists and the difference was found to be statistically significant (p = 0.049) (Table 2).

Practices regarding COVID-19

At the time of responding to the questionnaire, only 43.8% of the dentists had sensitized their staff as per the WHO guidelines for the prevention of COVID-19 in their workplace. Discussion regarding the risk of COVID-19

and preventive measures to be taken among their patients was reported by 68.5% and 79.0% of the dentists, respectively. A total of 32.0% of dentists took some kind of action to show their patients the signs and symptoms of the disease, whereas 99.2% took preventive measures against COVID-19. As many as 96.2% of the dentists admitted to including the travel history while recording the case history of the patient ($p = 0.025$), whereas 26% of them responded that COVID-19 had an effect on their social life ($p = 0.036$) (Table 2).

Knowledge and practice scores of the participating dentists

Based on the median of the scores obtained, the cut-off points for the knowledge (maximum score 13) and practice (maximum score 7) scores were 8 and 4 respectively. No dentist achieved a prefect knowledge score (range: 5–12), but perfect scores were observed in the practice section of the questionnaire (range 1–7). High/Good knowledge and practice scores were seen in 92.7% and 79.5% of the participating dentists, respectively (Table 3).

Association between demographic variables and knowledge and practice scores

The multiple linear regression model to analyze the knowledge and practice scores in relation to demographic variables revealed that good knowledge scores were significantly associated with qualifications ($p = 0.04$) and the years of practice ($p = 0.02$), whereas good practice scores were associated with qualifications only ($p = 0.03$) (Table 4).

Relationship between knowledge and practice scores

A positive, linear, great strength of association (r: +0.669) and a significant relationship ($p = 0.02$) was found between good knowledge and practice scores using Pearson's correlation coefficient (Table 5).

Discussion

The transmission of COVID-19 poses a risk for people who come in close contact with an infected individual, and the risk is greater among those who are in close proximity to or work near the patient, i.e., relatives and healthcare workers. The distance between the working field and the dentist is approx. 35–40 cm, and certain procedures can be very time-consuming, which puts the dentist at a higher risk of contacting COVID-19.[14,15]

Table 3. Knowledge and practice scores of the participants regarding Coronavirus Disease 2019 (COVID-19)

	Characteristic	Value
Knowledge	range of scores achieved (maximum 13)	5–12
	mean ±*SD*	8.1 ±2.5
	median (cut-off point)	8
	high/good knowledge scores n (%)	797 (92.7)
	low/poor knowledge scores n (%)	63 (7.3)
Practice	range of scores achieved (maximum 7)	1–7
	mean ±*SD*	4.1 ±2.5
	median (cut-off point)	4
	high/good practice scores n (%)	684 (79.5)
	low/poor practice scores n (%)	176 (20.5)

SD – standard deviation.

Table 4. Association between demographic variables and the participants' knowledge and practice scores using the multivariate linear regression analysis

	Predictor	Coefficient	*SD*	*t*	*p*-value
Knowledge	constant	26.42	2.26	40.21	0.00
	qualifications	2.23	3.19	2.60	0.04*
	years of practice	−1.02	0.52	−0.99	0.02*
	location (continent of residence)	2.32	0.43	6.21	0.55
Practice	constant	33.47	1.02	20.06	0.00
	qualifications	1.23	1.14	4.30	0.03*
	years of practice	5.21	2.12	2.11	1.62
	location (continent of residence)	−6.88	0.25	2.66	0.83

* statistically significant ($p < 0.05$).

Table 5. Correlation between knowledge, attitudes and practices using Pearson's correlation test

Relationship between		Pearson's coefficient of correlation	CI	*p*-value
knowledge	practices	+0.669	0.77–26.64	0.02*

CI – confidence interval; * statistically significant ($p < 0.05$).

To assess the preparedness of the healthcare worker to combat any disease outbreak, researchers across the globe try to assess their knowledge of the disease. The present knowledge scores regarding COVID-19 (92.7%) are higher as compared to those presented by Gupta et al. (the Zika virus (ZIKV) pandemic; 38.2% among Indian dentists), Fatiregun et al. (the swine influenza (H1N1) virus; 31% among senior Nigerian healthcare workers), Aung et al. (the Ebola virus; 54.7% nursing students in Myanmar), Shivlingesh et al. (the influenza A (H1N1) outbreak; 52.6% of the Indian population), and Singh et al. (the ZIKV outbreak; 61.7% among the students of a dental institute).[16–20] An important aspect of this study is that responses were collected on a multinational scale, and such high knowledge scores are promising as far as the role of dentists in combating the COVID-19 outbreak is concerned.

In this context, recording properly the travel history of the patient prior to any treatment becomes paramount. In developing countries, purchasing extra PPE (gowns, gloves, etc.) and the cost of the fumigation/sterilizing of the dental clinic can impact the dental clinician financially; hence, incorporating the travel history can help significantly reduce the transmission as well as the burden of the disease. International travelling has sharply increased over the past few years due to declining air fares, easy accessibility, flexible timings, and an increasing number of airports, which in turn is contributing to traveler-associated infections (especially respiratory infections).[21] In the present study, 96.2% of the dentists reported including the travel history while recording the history of the patient and this was important in a timely diagnosis, which could prevent further propagation of infection.

The initial source or information among the dentists was the Internet (37.7%), followed by the social media (30.9%), which is in agreement with the results obtained by Gupta et al., who reported that during the ZIKV pandemic, most of the knowledge gained by the dentists in the Tricity area in India, had its source in the Internet (37.8%).[16] During the development of a new strain of an infectious agent, there might not be enough data available in scholarly journals and/or textbooks, and hence, dentists might access trusted sites like the ones of the Centers of Disease Control and Prevention (CDC), WHO or the websites of health ministries of their respective countries for information. The use of the Internet however, is dependent on various factors like personal preferences, internet availability, type of device, speed, cost, etc. In contrast to this study, Fatiregun et al. reported television as the primary source of data (73.6%) among senior healthcare workers in Nigeria during the influenza A (H1N1) pandemic.[17]

All dentists agreed that they could help spread awareness regarding the disease, and that hand hygiene and PPE were effective in preventing COVID-19. The threat of any epidemic makes all healthcare providers alerted, as they are at a high risk of contracting infection and it is the nature of their work to selflessly treat their patients.

As per the GeoSentinel surveillance survey, 11% of the respiratory tract infections were reported among the travelers returning to their country of residence, and PPE can provide protection as well as reduce the risk of any nosocomial infections and cross-transmission in the dental setting.[22,23] Therefore, the risk to the healthcare worker is not only from external travelers, but also from their regular patients who travel on a regular basis, and this threat was acknowledged by the dentists who could correctly (with statistical significance) identify the system affected in COVID-19.

Alarmingly, only 43.8% of the dentists reported that their staff was sensitized as per the WHO guidelines for the prevention of COVID-19. This has to be addressed immediately and care should be taken to sensitize the auxiliary staff as per the current CDC and WHO guidelines to combat the spread of this disease.

A total of 825 (95.9%) dentists responded that COVID-19 was fatal in nature and this could be attributed to the fact that the mortality associated with any new outbreak (although lower in the case of COVID-19) instills a fear of the unknown among people. These figures are on the higher end when compared to the responses of the healthcare providers assessing the fatality of the ZIKV (54.8%) and H1N1 (51%) pandemics.[24,25] Since the responses of the present study were collected when COVID-19 was spreading to other nations, little was known about the characteristics of the virus and there was less information regarding the patients cured of COVID-19, the participating dentists might have assumed that COVID-19 had a high fatality ratio.

The outbreak of COVID-19 has shown a drastic effect on one's social life, since all mass gatherings and social events are being avoided to reduce the transmission rates. Apart from other preventive measures, significant differences are noticed between the continents regarding the number of people avoiding social gatherings.

It was observed that the dentists with higher qualifications (postgraduates) reported better and significant knowledge scores as compared to graduates. Various authors have documented similar findings during the ZIKV and Ebola hemorrhagic fever pandemics.[16,26,27] The possible explanation might be that postgraduate studies involve performing some kind of research (thesis) and updating the dentist's knowledge based on recent guidelines and evidence-based practice. Contrary to our findings, Harapan et al. reported that general practitioners had a higher OR of having a good knowledge as compared to specialist doctors.[28] This can be attributed to global disparities in the dental curriculum and attitudes of the dental faculty authorities toward motivation, encouragement, involvement, and providing assistance to undergraduates in any kind of research projects.

The study is prone to some limitations, one of them being the social desirability bias. In order to eliminate it, we did not ask for any personal information and assured

the participants as to the confidentiality of their data. Secondly, due to the cross-sectional nature of the study and the employed sampling technique, the self-selection bias on the side of the respondents could have occurred. Since this questionnaire was designed to reach the global population of dentists, and due to geographical variations in the way English is spoken and comprehended across the world, inadvertently, there was a slight possibility that the dentists might have experienced the questionnaire bias while answering the questions. However, during the implementation of the pilot study itself, it was ensured that the questions were kept as neutral and simple as possible to avoid such kind of bias.

Conclusions

In the present study, dentists were found to obtain good knowledge and practice scores, which is important to combat COVID-19. Dentists should appropriately use the social media to spread awareness among people, and in their clinical practice, they should screen, isolate and refer the potential cases having the symptoms of COVID-19. They are also advised to follow the CDC and WHO guidelines in their clinics, and sensitize their staff so that no stone is left unturned in defeating this pandemic.

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