

Dentists' Perception and Awareness Towards COVID-19 and Infection Control: Cross-sectional Study Among a Sample of Egyptian Dentists

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Abstract

Background: Despite the convenience of Centers for Disease Control and Prevention (CDC), American Dental Association (ADA) and WHO guidelines and recommendations, some dentists and dental assistants may have a lack of knowledge of the requirements of COVID-19 control. This may be due to the high flow rate of patients in some public and private clinics with reduced dental fees. This cross-sectional study evaluated awareness level, perception and attitude regarding COVID-19 among Egyptian dentists.

Methods: The study population was dentists who worked in universities, private clinics, hospitals and health centers in Egypt. An online questionnaire composed of 35 questions sent to a sample of Egyptian dentists between April and May 2020. The questionnaire was comprised of a series of questions about dentists' demographic characteristics, their awareness of COVID-19, infection control measures needed to limit the infection and spread of COVID-19.

Results: 413 dentists participated in this study, 232 females and 181 males, one third of the participants were general dentists and around half of the participants had a private practice. 31.8% of the participants took the information about COVID-19 from social media and 26% read CDC and ADA guidelines. Almost all, 96% of the dentists answered the symptoms that COVID-19 infection presents with a dry cough and fever with 2-14 days is the incubation period. Half of the participants considered COVID-19 an airborne infection. Relative to that, 1-3 meters is the optimum social distancing, and human behavior only can influence COVID-19 infection spread. During this time period, 86% of dentists worked only emergencies cases, 72% considered dental emergency as the combined symptoms of swelling, trauma and severe pain, 84% of the participants considered disposable gown, eye protection, N95/ KN 95 mask and gloves as effective personnel protective equipment during dental treatment.

Conclusions: Egyptian dentists were aware of COVID-19 symptoms, mode of transmission, infection control, and protective measures in dental clinics.

Keywords: COVID-19; Infection Control; Dental Practice; Survey Research

Introduction

SARS-CoV-2 is a novel emerging coronavirus that first caused (COVID-19) disease in 2019. Due to the outbreak in China on January 8, 2020, the WHO declared it officially to be a global problem worldwide [1]. COVID-19 belongs to the coronavirus family which causes an infectious respiratory disease along with cardiovascular and other conditions in adults and children. Human to human transmission is through aerosol contact with an infected person or a contaminated surface. The incubation period of COVID-19 virus is from 2 to 14 days though the person could still be contagious before any symptoms could be detected [2,3]. This makes it challenging for medical staff to detect the COVID-19 infection that could increase the disease transmission during these dormant periods. Patients that are COVID 19 carriers without showing symptoms potentiate a great risk to dental staff members and other patients [4,5].

COVID-19 is detected in saliva, which makes it as a potential transmission route in dental practice [6,7]. There is a higher risk of infection due to close contact with the patients and the saliva-contaminated aerosols and droplets during dental treatment. This can lead to direct contamination of exposed skin/eyes/mucosa or inhalation. Saliva contaminated droplets and aerosols can contaminate surfaces in the dental clinic, which may lead to cross-infection [8,9].

The control of saliva-related transmission in the dental clinic is critical, particularly in the epidemic period of COVID-19. Protective measures can help to reduce the risk of saliva-related COVID-19 transmission. Many precautions should be taken in hospital settings and private dental practices in order to avoid the possible spread of COVID-19 among patients, dentists, dental assistances and nurses [10]. Personal protective equipment (PPE) is critical for infection control. Protective goggles or face shields, well fitting masks, gloves, and caps should be regularly worn by the practitioner. There are a recommended guideline that were released by the Centers for Disease Control and Prevention (CDC) [11], the American Dental Association (ADA) [12], and the World Health Organization in order to prevent the spread of COVID-19. The recommendations were to perform proper hand hygiene, avoid touching eyes, nose and mouth, social distancing of 2 meters, health care individuals to wear full PPE, and a detailed medical history to be taken from patients [11-13].

Objectives

Despite the convenience of CDC, ADA and WHO guidelines and recommendations, some dentists and dental assistants may have a lack of knowledge of the requirements of COVID-19 control. This is may be due to the high flow rate of patients in some public and private clinics with reduced dental fees [14,15]. This situation is present in many countries in addition to Egypt, Therefore, this study was aimed to monitor and assess awareness level, perception and attitude regarding COVID-19 among Egyptian dentists.

Subjects and Methods

Study population

This cross sectional study targeted the population of Egyptian dentists who work in universities, public and private clinics or other health care settings. This survey was conducted in April and May of 2020. An online questionnaire using Google Forms was used to collect the data. The questionnaire was given to dentists through Facebook groups and an Egyptian dental syndicate. All dentists agreed to participate by an online written consent in this study before completing the Google forms. The questionnaires were anonymous to maintain both privacy and confidentiality of all study information. participants have voluntarily involved in this study and a sentence of the study design was present in the google form and no personal information was obtained, no written consents were obtained. The experimental protocol was approved by the Local Ethical Committee of Ain Shams University.

Study instrument

A questionnaire containing thirty five detailed questions was developed after reviewing relevant literature and CDC, ADA and WHO international guidelines. The questionnaire was conducted in English and consisted 31 multiple-choice questions and 4 other questions (3-point Likert scale). The survey assessed six primary domains; the first domain is personal information regarding age, specialty, location and nature of dental practice. The second domain was regarding percent of dental practice closure and source of COVID-19 protocol and prevention. The third domain was the dentist's general information about COVID-19 symptoms, how long does the virus live on various types of surfaces, factors influencing viral spread and basic controls. The fourth domain was the concern regarding risk of COVID-19 infection to dentists and their families. The fifth domain was the percent of dental treating patients during COVID-19 outbreak, type of dental procedures, type of radiograph,

use of rubber dam and ultrasonic scaling. The sixth domain was the protective guidelines including handwashing, kind of masks, sterilization of masks, eye protection, the recommended disinfection for flooring, dental units, clothes, etc.

Data analysis

Data were analyzed using SPSS (IBM Corp). Descriptive statistical analysis was used to describe items included in the survey. Means and standard deviations were used to describe the continuous variables, and percentages were used to describe the data.

Results

A total of 463 dentists participated in this study. Of this, 50 dentists practiced outside Egypt so the net participants were 413. The data is presented in both number of participants and their percentage.

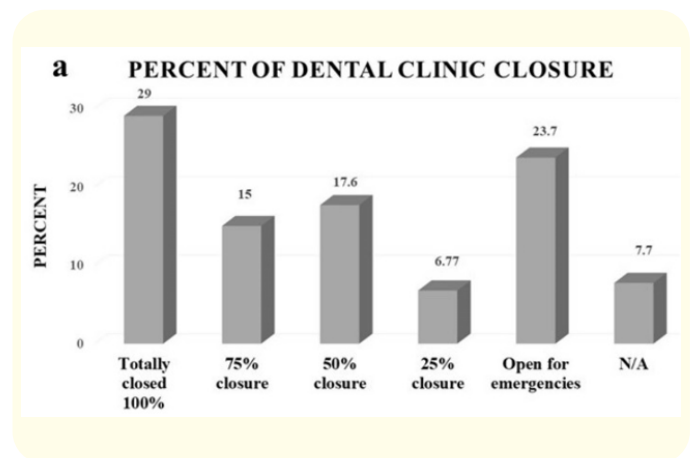
The demographic data of the participants is presented in table 1. Two hundred thirty two females and 181 males participated in this study. Fifty nine percent of the participants age were ≤30 years old, the higher percent of their location were faculty based (34%) and large city (46.9%), one third of participants were general dentists and around of half of the participants had a private practice.

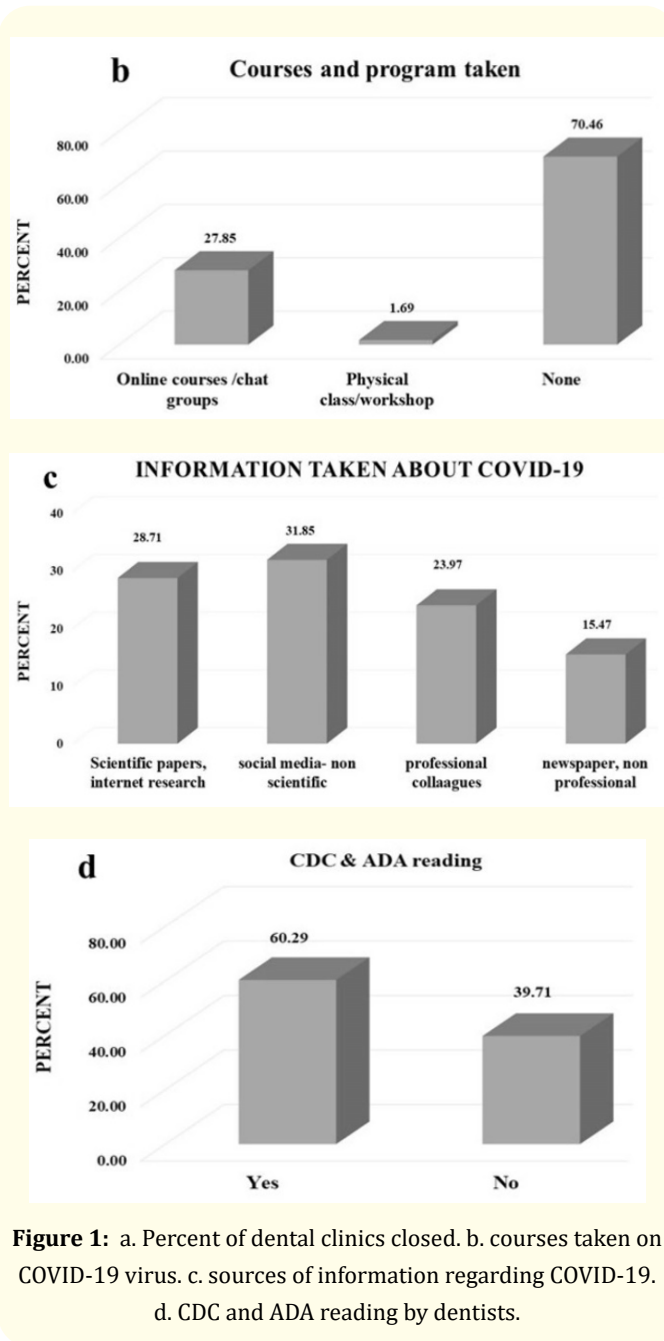
Oral surgery, Maxillofacial surgery	21	(5.08)
Orthodontics	15	(3.63)
Pedodontics	24	(5.81)
Periodontics	58	(14.04)
Prosthodontics	30	(7.26)
Public health	2	(0.48)
Nature of practice		
Academics, Research	74	(17.92)
Government/Military	86	(20.82)
Private Practice	227	(54.96)
Other	26	(6.30)
Academics, Research	74	(17.92)
Government/Military	86	(20.82)
Private Practice	227	(54.96)
Other	26	(6.30)

Table 1: Demographic data of the participants.

The results of the second domain of the questions were related to the percent of dental clinic closure. This showed 29% of participants fully closed their clinics, 23.7% were open only for emergency and the least percent 6.7% of participants closed their clinic only 25% for regular work (Figure 1a). Most of the participants (70%) did not take any online courses or workshops regarding COVID-19 (Figure 1b). However, the higher percent of information about COVID-19 was taken from social media (31.8%) followed by scientific research (28.7%). About one quarter, 26% of the participants read the U.S. CDC and ADA guidelines (Figure 1 c, d).

Variable	Dentists number (%)	
Gender		
Male	181	(43.8)
Female	232	(56.2)
Age		
≤30	246	(59.5)
>30	167	(40.6)
Location of dental practice		
Dental school – educator, non clinical	50	(12.1)
Faculty based practice	142	(34.38)
Large city	194	(46.97)
Rural	15	(3.63)
Suburban	12	(2.9)
Training		
Endodontics and restorative	58	(14.04)
General dentist	128	(30.99)
Graduate student	73	(17.68)
Oral Pathology	4	(0.97)





The third domain of the study was dentist’s information regarding the COVID-19 virus itself. Regarding the symptoms of infection by COVID-19 96% said patients present with dry cough and fever. Half of the participants considered COVID-19 to be an airborne infection. Less than one third of the participants considered PCR sensitivity to diagnose COVID-19 only 70% accurate. Half of the

participants considered 8 hours is the time that COVID-19 can live on surfaces, 60% of the participants answered that stainless steel and plastic can be a stable surface for COVID-19 virus. Just over half of the dentists surveyed considered that human behavior alone can influence COVID-19 infection spread; with half of the participants considered 1-3 meters ss the optimum for social distancing. Two thirds of the participants believed that 2-14 days is the incubation period of COVID-19 virus and 41% of the participants have heard or read that 80% of infected cases have been traced to asymptomatic patients (Table 2).

Variable	Dentists number (%)	
Symptoms of COVID-19 infection		
Dry cough and fever > 38 C or 100.4F	397	(96.13)
Dry cough and no fever	8	(1.94)
Fever only	1	(0.24)
I do not know	7	(1.69)
COVID-19 is considered airborne infection		
Yes	216	(52.3)
No	160	(38.74)
I do not know	37	(8.96)
Sensitivity of Polymerase chain reaction (PCR) to COVID-19 diagnosis		
Highly sensitive 100%	63	(15.25)
Around 95%	102	(24.7)
Moderately sensitive 70%	132	(31.96)
I do not know	116	(28.09)
For How long COVID-19 virus can live on surfaces?		
1 hour	24	(5.81)
4 hours	87	(21.07)
6 hours	88	(21.31)
8 hours	203	(49.15)
Not live on surfaces	11	(2.66)
Which surface the COVID-19 can be more stable to live on?		
Copper and cardboard	52	(12.59)
Plastic and stainless steel	248	(60.05)
I don't know	113	(27.36)
Factors that influence the spread of COVID-19 virus infections		

Human behavior	230	(55.69)
Temperature	7	(1.69)
Humidity, Human behavior	35	(8.47)
Temperature, Human behavior	53	(12.83)
Temperature, Humidity	4	(0.96)
Temperature, Humidity, Human behavior	84	(20.34)
The minimal social distancing to limit COVID-19 virus spread		
0.5 m - 1.5 feet	23	(5.57)
1 m - 3 feet	228	(55.21)
2 m - 6 feet	160	(38.74)
No distance needed	2	(0.48)
How long can it take from exposure to clinical symptoms of COVID-19?		
2 days	7	(1.69)
7 days	14	(3.39)
2 - 14 days	273	(66.10)
14 days	119	(28.81)
Who can transmit the COVID-19 infection?		
Patients as soon as they have been exposed to a COVID-19 positive patient, 80% of infected cases have been traced to asymptomatic patients.	161	(38.78)
Patients only if they have a fever	35	(8.52)
Patients only if they have a cough	47	(11.4)
80% of infected cases have been traced to asymptomatic patients.	170	(41.3)

Table 2: Information regarding COVID-19 infection.

The fourth domain of this study was dentist's awareness of the risk of infection from COVID-19. Most, 87% agreed that dentists can enhance community awareness to limit COVID-19 infection spread. Half of the dentists refused to treat patients with active disease, 46% of the participants considered moderate risk of COVID-19 infection despite of protective equipment, Just under two thirds of the participants considered that there is a high risk of transmitting a COVID-19 infection to their families (Table 3).

Variable	Dentists number (%)	
Dentists and their staff can enhance patient awareness to limit the spread of COVID-19 virus		
Agree	362	(87.65)

Uncertain	39	(9.44)
Disagree	12	(2.91)
Treatment of patients with active COVID-19		
Agree	73	(17.67)
Uncertain	113	(27.36)
Disagree	227	(54.96)
Percentage risk of infection of health care personnel despite the use of appropriate protective equipment		
High risk 100%	164	(39.71)
Moderate risk	193	4(46.73)
Low risk	56	(13.56)
There is a concern that the risk of COVID-19 infection can spread to dentist's family		
High risk 100%	248	(60.0)
Moderate risk	131	(31.72)
Low risk	33	(7.99)
No risk 0%	1	(0.24)

Table 3: Dentists awareness of infection risk of COVID-19.

The fifth domain of this study was the type of treatment rendered by dentists during the pandemic. In their offices or clinics, 86% of dentists worked only on emergencies, 72% considered dental emergency as the combined symptoms of swelling, trauma and severe pain. Two thirds of the participants considered panoramic is the optimum radiograph during the outbreak. The use of rubber dam was agreed by 81.8% of the surveyed dentists to decrease COVID-19 spread in restorative and endodontic treatment. Most dentists, 93%, agreed that ultrasonic scaling can enhance COVID-19 spread (Table 4).

Variable	Dentists number (%)	
What kind of dental treatment can be performed during the COVID-19 virus outbreak?		
Emergency only	356	(86.2)
Elective dental treatment	37	(8.96)
Full dental treatment	20	(4.84)
What is the meaning of emergency in dental practice?		
Swelling	5	(1.2)
Trauma	2	(0.48)
Swelling, Severe pain	21	(5.08)
Severe pain, Trauma	41	(9.92)

Swelling, Trauma	6	(1.45)
Swelling, Severe pain, Trauma	299	(72.4)
What is the type of radiograph preferred during COVID-19 outbreak?		
Panorama	279	(67.55)
Periapical	35	(11.1)
I do not know	71	(22.6)
No radiograph	28	(8.9)
Is it recommended to use rubber dam to limit the spread of COVID-19 in restorative and endodontic procedures?		
Agree	338	(81.84)
Uncertain	57	(13.8)
Disagree	18	(4.36)
Does the use of high speed or ultrasonic scaling assist in the spread of COVID-19?		
Agree	385	(93.2)
Uncertain	18	(4.36)
Disagree	10	(2.42)

Table 4: Dentists information regarding dental treatment.

The sixth domain was the knowledge of general disinfection by dentists. About three quarters, 71% agreed that water and soap is effective for hand wash. A little more than one third, 39% chose N95 or KN95 or surgical mask for patients' examination followed by 36.5% that chose only N95 or K95 mask only and no surgical masks. Just over half, 59% chose not to reuse or sterilize N95 masks. Not quite half, 43% prefer face shield only during dental treatment followed by 42% that prefer face shield or eye goggles. Over three quarters, 84% of the participants considered disposable gown, eye protection, N95 mask and gloves as effective PPE during dental treatment. The recommended disinfectant for dental units floors were 2% sodium hypochlorite (30%) followed by 50% sodium hypochlorite (25%) and 30% alcohol (20%). When it comes to washable clothing and the recommended disinfectant protocol, 48% believed the best way to go is regular water and soap (Table 5).

Discussion

This survey provides an idea of dentist's perception regarding information and procedures of infection control with a special em-

Variable	Dentists number (%)	
Is it effective to properly wash your hand with water and soap?		
I rather will use 70% alcohol following hand wash	115	(27.85)
Yes	297	(71.9)
No	1	(0.24)
What kind of mask you will use during patients examination and treatment?		
N95 or KN95 respirator only	151	(36.56)
N95 or KN95 respirator or Surgical mask	162	(39.23)
Surgical mask	96	(23.24)
No mask	4	(0.97)
Will you reuse and sterilize your N95 mask?		
Yes	99	(23.97)
No	246	(59.56)
I don't know	68	(16.46)
What will you use for your eye protection?		
Face shield	179	(43.34)
Goggles	46	(11.14)
Face shield, Goggles	174	(42.13)
Nothing	14	(3.39)
Items included in the PPE worn by healthcare professionals during the COVID-19 outbreak.		
Disposable gown	13	(3.15)
Face shield	11	(2.66)
Gloves	5	(1.21)
N95 respirator	33	(7.99)
All of the above	348	(84.26)
None of the above	3	(0.73)
What is a recommended disinfectant for dental units, floors and surfaces?		
Regular soap and water	75	(18.04)
30% alcohol	84	(20.36)
2% sodium hypochlorite	126	(30.54)
50% sodium hypochlorite	103	(25.13)
I don't know	25	(5.93)

What is a recommended disinfectant for clothes?		
Regular soap and water	199	(48.12)
30% alcohol	56	(13.48)
2% sodium hypochlorite	90	(21.88)
50% sodium hypochlorite	28	(6.81)
I don't know	40	(9.71)

Table 5: General disinfection knowledge.

phasis on COVID-19 shortly after the time of the outbreak in 2020. This study included a broad based sample of Egyptian dentists. There were a nearly equal sample distribution between both genders. A higher percent of participants were age less than 30 years. The dentists who responded to the survey had a wide range of location, nature, training and experience in dental practice.

The ADA has always advocated dental practice infection control guidelines. After the COVID-19 outbreak, the ADA urged all practicing dentists, dental auxiliaries and dental laboratories to convey and practice guidelines to limit COVID-19 spread and infection [12,16]. In our survey 60% of the dentists read CDC and ADA instructions. However, the information about COVID-19 that a majority of dentists surveyed relied upon was taken from social media and non-scientific papers. Next frequent sources of information were scientific papers and internet research that highlight the influence of social media in information spread. Regarding COVID-19 courses, 70% of the participants did not take online courses or workshops nor did they belong to chat groups.

Patients with COVID-19 usually present with clinical symptoms of fever, dry cough according to 96% of the participants. Less obvious symptoms such as nausea, diarrhea, reduced sense of smell and abnormal taste sensation have also been reported in patients with COVID-19 [17]. Most were not aware of spread of the viral infection from asymptomatic carriers [2,3]. The primary route for transmission of coronavirus is through droplets and aerosols [18]. Other studies have suggested that COVID-19 is airborne through aerosols formed during medical procedures [19]. Half of the participants in this survey understand that the infection is transmissible by airborne means. Most of the participants felt that COVID-19 virus lives for 8 hours on surfaces.

According to Van Doremalen., *et al.* 2020 [20] aerosol and surface virus transmission can remain viable and infectious on sur-

faces for hours or days. The virus is more stable on surfaces such as stainless steel, but on copper surfaces, it appeared to be damaged. The virus can survive for 72 hours on surfaces of stainless steel and plastic, 24 hours in cardboard. In aerosolized form or in dust the virus can remain virulent from 40 minutes to 2 and one half hours [20,21]. Slightly over one half of the participants selected that human behavior is the main factor of COVID-19 spread. A study showed that temperature variation and humidity might be important factors affecting COVID-19 mortality [22]. The estimated incubation period of COVID-19 is up to 14 days [23]. Half of the responders were aware of defining a "close contact" according to the US CDC as: "being within approximately 6 feet (2 meters). When testing is evaluated, PCR sensitivity was presented in a paper to be 83.3% [24].

Dentists' awareness about their role towards patients' education in prevention of COVID-19 spread is critical though there is a moderate risk of infection during treatment with the appropriate use of personnel protective equipment, there could be a secondary high risk of infection to their families. The majority of dental clinics were totally closed or open only for emergencies. Emergencies were defined as pain, swelling and trauma. The use of a rubber dam is advised during applicable dental procedures as it significantly minimizes the spread of saliva- and blood-contaminated aerosol especially when high-speed hand pieces are used. Rubber dam can reduce airborne particles by 70% [25]. If rubber dam isolation is not possible, manual devices such as Carisolv and hand scaler are recommended for caries removal and periodontal therapy in order to minimize aerosol generation [9,25]. Most of the participants chose extraoral radiographic technique as panorama since taking a periapical radiograph may stimulate saliva secretion and coughing [26].

The most important control measures for control of spread of COVID-19 infection include hand hygiene before and after finishing the dental procedure with soap and water or using an alcohol-based hand sanitizer in the dental practice as the WHO recommends. Personal protective equipment (PPE) is important for infection control in the dental clinic, particularly considering that splatter/droplets contain potential saliva-borne pathogens. The dentists and dental assistants should regularly wear protective goggles or face shields, masks, gloves, long sterilized gowns and caps during the epidemic period of COVID-19 [4]. An N95 respirator is a respiratory protective device designed to achieve a very close facial fit and very efficient filtration of airborne particles.

These respirators block at least 95% of very small (0.3 micron) test particles which is why they are recommended. During aerosol-generating procedures conducted on patients assumed to be non-contagious, if a respirator is not available for an aerosol-generating procedure, use both a high level surgical mask (KN 95 or Level 3) and a full-face shield [18]. Most of the surveyed participants preferred to wear N95 or surgical mask with face shield or eye goggles. The recommended disinfectant to frequently touched surfaces or objects includes hydrogen peroxide, quaternary ammonium, sodium hypochlorite, and ethanol at various formulation types and contact times [27]. Most of the participants preferred sodium hypochlorite and ethanol as surface disinfectants, using regular soap and water for clothes.

Conclusion

In this survey, a large proportion of Egyptian dentists were aware of COVID-19 symptoms, mode of transmission, infection control, and precautionary measures to be taken in dental clinics. National dental associations should send national and international guidelines to all registered dentists. The level of preparedness of the dentist, staff and facility will determine what procedures can safely be performed, both for the patient and for the dental staff. During the most active part of this or any other disease outbreak, only those dental procedures that are emergencies should be performed. As disease transmission is understood, testing, staff preparedness, training and eventual vaccine and/or treatment become more available, more dental facilities will be able to return to delivering full "routine" therapies. The results of this survey can assist in national training strategies in Egypt and elsewhere related to COVID-19 and other issues as they arise. Surveying dental students, residents and practicing dentists will ascertain their current level of knowledge. From this starting point, local, regional and national governing bodies can develop the appropriate educational curriculum to ensure the highest level of preparedness for their safety as well as that of their colleagues, staff members and patients for this and other future health crises.

Availability of Data and Materials

The corresponding author will make available data in this study upon request.

Competing Interests

All authors declare no conflict of interest.

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