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ROLE OF DENTAL PROFESSIONAL IN COVID 19 PANDEMIC: A COMPREHENSIVE REVIEW

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ABSTRACT

SARS-CoV-2, a virus causing the severe acute respiratory syndrome, has inundated the whole world, generating global health concerns. The World Health Organization announced that the outbreaks of the novel coronavirus have constituted a public health emergency of international concern. Transmission occurs primarily through droplet spread or contact routes. Due to the characteristics of dental settings, the risk of cross-infection can be high between patients and dental practitioners. Dental specialists in the upcoming days will likely come across patients with presumed or confirmed COVID-19 and will have to ensure stringent infection prevention and control to prevent its nosocomial spread. Therefore, a greater understanding of the structure of the virus, modes of transmission, clinical features, and testing methods is needed that can help to form protocols for dental practices to identify cases and prevent further spread of infection to the patients.

REVIEW ARTICLE

INTRODUCTION

Several epidemics (such as H1N1, H5N1, avian influenza, Ebola, SARS, Zika, and Nipah) have affected India and other countries in the past, which were successfully tackled with appropriate research [1]. Zoonotic diseases constitute a large group of infections that can be transmitted from animals to humans, regardless of the presence of vectors [2]. Approximately 80% of viruses, 50% of bacteria, and 40% of fungi are capable of generating a zoonotic infection [3]. Bats are considered important reservoirs and vectors for the exponential spread of zoonotic infectious diseases; they are associated with SARS and Ebola, the latter of which was responsible for an epidemic with its epicenter in Sub-Saharan Africa in 2014 [4]. SARS coronavirus in 2003 and 2019 and H1N1 flu in 2009 have demonstrated how a zoonotic infection can spread rapidly among humans, causing potentially irreversible global repercussions, for man economic, social, and health-related standpoint [3]. Compared to previous eras, globalization and the intensification of international movements have greatly facilitated the spread of viruses [2–5]. On January 8, 2020, a novel

coronavirus was officially announced as the causative pathogen of COVID-19 by the Chinese Center for Disease Control and Prevention [6]. A novel human coronavirus initially referred to as the Wuhan coronavirus (CoV), currently designated as severe acute respiratory syndrome (SARS)-CoV-2, is responsible for the latest pandemic that is affecting human health and economy across the world [7]. On 30 January 2020, the WHO declared the Chinese outbreak of COVID-19 to be a Public Health Emergency of International Concern because of its rampant spread, thus posing a high risk to countries with vulnerable health systems. On 11th March 2020, the World Health Organization (WHO) declared the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or Coronavirus Disease 2019 (COVID-19) as a pandemic. The ongoing COVID-19 pandemic was first confirmed to have spread on 30 January 2020 in India with the first reported case in Kerela. [1]. Given the widespread transmission of SARS-CoV-2, healthcare providers are at an increased risk of contracting the infection and becoming potential carriers of the disease. According to Occupational Safety and Health Administration (OSHA), dental health care personnel (DHCP) are placed in very high exposure risk categories as dentists work close to the patient's oral cavity [9]. Also, dental procedures involve the use of rotary instruments such as handpieces and scalers, which generate aerosols. The publication aims to provide a brief overview of the etiology, incubation, symptoms, and transmission paradigms of this novel infection and how to minimize the nosocomial spread in the dental healthcare setting.

Structure

SARS-CoV-2 is the seventh member of the family of coronaviruses that infect humans. It is a novel virus belonging to the subgenus sarbe-virus, Orthocoronavirinae subfamily [10]. They are composed of an envelope, a lipid layer, and single-stranded RNA as their genome [11]. The name "corona" ("crown" in Latin) is attributed to the spherical shape and surface projections.

Four subfamilies have been identified: alpha-, beta-, gamma-, and delta-coronaviruses . Beta-coronaviruses seem to originate from m ammals, namely bats; it was found that the gen ome sequence of SARS-CoV-2, the virus resp onsible for COVID-19, is >90% identical to a bat coronavirus RaTG13. Bats represent a nat ural reservoir for a wide variety of coronavirus es including SARS-CoV-like and MERS-CoV -like viruses. SARS-CoV-2 is closely related t o the SARS-CoV virus, and it belongs to the B lineage of the beta- coronaviruses which are known to cause severe disease and fatalities [12]. Only α- CoV and β-CoV genera can usually infect humans and vertebrates, causing respiratory and gastrointestinal problems and damage to the central nervous system [6] genome (26-32 kb) [13]. For coronavirus, the entry in the host cells is a complex mechanism determined by the transmembrane spike glycoprotein and the angiotensin-converting enzyme 2 (ACE2) as a receptor [14, 15]. After the entry, SARS-CoV-2 releases the viral genome to the cytoplasm, promoting the virus replication mechanism [14].

Mode of Transmission

The COVID 19 transmission started with a single animal-to-human transmission, followed by the sustained human-to-human spread. It is now believed that its interpersonal transmission occurs mainly via respiratory droplets and contact transmission [16, 17]. Also, there may be a risk of fecal-oral transmission, as researchers have identified SARS-CoV-2 in the stool of patients from China and the United States [18]. It has now been realized that infected patients, whether symptomatic or asymptomatic, are the main sources of transmission of the infection [19]. Transmission via droplets occurs only in cases of close contact (within 1 meter) with those who have respiratory symptoms as there is a risk of oral/nasal mucosa or conjunctiva

getting exposed to potentially exposing infected respiratory droplets when the person sneezes, coughs, or talks loudly [20].

Incubation Period

The incubation period of COVID-19 has been estimated at 5 to 6 days on average, but there is evidence that it could be as long as 14 days, which is now the commonly adopted duration for medical observation and quarantine of (potentially) exposed persons [21]. The R0 (the basic reproductive number/ infectious agent's epidemic potential) for SARS-CoV-2 ranges between 1.4 and 6.5, with an average of 3.28 [22, 23]. The disease may be highly infective, owing to viral shedding in early disease, SARS-CoV-2 transmission from asymptomatic carriers [24-26], and transmission through individuals during the incubation period [19].

Clinical manifestations

The majority of patients with COVID-19 represent relatively mild cases. According to recent studies and data from the National Health Commission of China, the proportion of severe cases among all patients with COVID-19 in China was around 15% to 25% [27]. COVID-19 may manifest as flu-like symptoms, ranging from dry cough, fever, sore throat, headache, lethargy, and diarrhea in few to troubled breathing, persistent pain or pressure in the chest, and bluish lips or face, which are emergency warning signs and necessitate immediate attention [28, 29]. Another common symptom is pneumonia which can be seen on chest X-ray or chest CT as multiple small patchy shadows and interstitial changes, remarkable in the lung periphery. Organ dysfunctions such as acute respiratory distress syndrome (ARDS), acute cardiac injury (shock and arrhythmia), acute kidney injury, and death can occur in severe cases [22, 23]. Age and comorbidity are risk factors for poor outcome [23].

Dentists must be cognizant of oral findings and features, such as dysgeusia/ ageusia, xerostomia, and exanthematous lesions like ulcers or blisters which might be early symptoms of COVID-19 and present before other typical clinical symptoms. Self-divulged loss of taste and smell is considered a much more substantial predictor of a positive COVID-19 diagnosis than self-diagnosed fever.

Diagnosis

The diagnosis of COVID-19 can be based on a combination of epidemiologic information (e.g., a history of travel to or residence in the affected region 14 days before symptom onset), clinical symptoms, CT imaging findings, and laboratory tests (e.g., reverse transcriptase-polymerase chain reaction [RT-PCR] tests on respiratory tract specimens) according to standards of either the WHO or the National Health Commission of China [10]. A confirmed case is one which is positive for the 2019-nCoV by the real-time PCR test [30]. A single nasopharyngeal swab early in the course of disease is only 70% sensitive [31]. Hence, a single nasopharyngeal swab cannot be trusted blindly. To et al. found the presence of the novel coronavirus in self-collected saliva specimens of 91.7% patients, which might be a viable source for diagnosis [32]. Rapid testing and monitoring of COVID-19 has been developed and approved by FDA, which will ease the pressure on hospitals, prevent the spread of infections, and save time [33]. Clinically, we should be alert of patients with an epidemiologic history, COVID-19–related symptoms, and/or positive CT imaging results.

Management

So far, there has been no evidence from randomized controlled trials to recommend any specific anti-nCoV treatment, so the management of COVID-19 has been largely supportive (WHO 2020a). Currently, the approach to COVID-19 is to control the source of infection; use infection prevention and control measures to lower the risk of transmission; and provide early diagnosis, isolation, and supportive care for affected

patients [34]. A series of clinical trials are being carried out to investigate interventions that are potentially more effective (e.g., lopinavir, remdesivir;) Severe cases require respiratory assistance with organ support in intensive care. No specific antiviral treatment exists, but antiviral, antimalarial, and biological drugs are administered in clinical trials [35].

Considerations in the dental practice

DHCP (dentists, dental hygienists, dental assistants, and receptionists) need to update their knowledge and skills regarding infection control and follow the protocols recommended by the relevant authorities to protect themselves and their patients against infections. The infections can occur through the puncture of sharp instruments or direct contact between mucous membranes and contaminated hands [36]. Sound knowledge of the spread of SARS-CoV-2 is required to prevent its transmission in dental practice. Aerosols are a predominant route for transmission of pathogens including SARS-CoV-2; therefore, stringent infection control measures are imperative [22–24].

Pre-visit Preparation

- An attempt should be made to telephone triage all patients in need of dental care. Teledentistry can be of great assistance in the current pandemic situation. the entire process of networking, sharing digital information, distant consultations, workup, and analysis are dealt with by a segment of the science of telemedicine concerned with dentistry known as “Teledentistry” (37]
- It is fundamental to contact the patient by phone and ask a few questions about his/her state of health, especially if he/she has a fever (>37.5°C), cold, cough, breathing difficulties, muscle pain, headache, which has arisen in the last 14 days. Also, it is necessary to ask the patient if he/she has visited areas at risk, or if he/she has been in contact with infected people or people coming from an infectious outbreak, or with people who had symptoms, in the last 14 days. If the patient presents one of the above symptoms, it would be wise to suggest drug therapy to the patient by telephone, considering his/her medical history.
- The ADA and the Centers for Disease Prevention and Control (CDC) recommend keeping the waiting room empty, without magazines, and avoiding the overlap of two or more appointments. If this is not possible, the minimum distance between one patient and the other must be 2 m (6 feet) in each direction [38].
- All staff should change into different office clothing once they reach the office. Dentists, staff, and patients should be asked to hold-off on accessories such as bracelets, necklaces, and watches.
- Cleaning and disinfection and sterilization of the reception, waiting area, and equipment must be ensured [39].
- In patients with a cured COVID-19 infection, the American Dental Association (ADA) guidelines propose to reschedule dental treatment at least 72 h after the resolution of the symptoms, or 7 days after the appearance of initial symptoms, such as fever controlled without antipyretics and spontaneous improvement of breathing [40].

Dental office visit preparation

- Patients should be called about their appointment and informed about the details of screening and in-office protocol. Temperature measurement is recommended when the patient enters the dental office; if the body temperature exceeds 37.3 C, it is suggested the treatment be postponed [39].
- As far as pediatric dentistry is concerned, persons accompanying minor age patients are asked to come to the appointment in the smallest possible number, wear a protective mask, wait in the waiting room, and not attend the patient’s treatment to avoid the risk of aerosol inhalation [41].

- Further accurate studies have been carried out to demonstrate the importance of oral rinses just before dental treatment. Since COVID-19 is sensitive to oxidation, Peng et al. proposed rinsing with 1% hydrogen peroxide or with 0.2% povidone-iodine [42].
- Pre-procedural mouth rinse with oxidative agents such as 1% hydrogen peroxide or 1% povidone-iodine is considered to minimize the viral load [39], thus helping in the reduction of aerosols and salivary pathogens concerned with 2019-nCoV. Other mouth rinses with chlorhexidine, Citrox, cyclodextrins combined with Citrox, and amphiphilic-cyclodextrin may prove to be beneficial but require further studies [42].
- It is recommended that the highest level of personal protective equipment (PPE) available is used by the dental surgeon and dental assistant while treating patients which includes gloves, gown, head cover, shoe cover, eye protection including goggles or a disposable/reusable face shield that covers the front and sides of the face, and a N954 or higher-level respirator. A combination of a surgical mask and a full-face shield can be used in situations when a respirator is not available [09].
- Hand hygiene is considered the first step in limiting the spread of the virus; WHO guidelines impose scrupulous hand-washing before and after any contact with the patient [40].
- Hand hygiene: 80% ethanol or 75% 2-propanol as an Alcohol-Based Hand Rub (ABHR), against SARS-CoV and MERS-CoV, was found to be efficient. [09].
- High-speed rotating instruments, such as the turbine and the contra-angle, must be equipped with an anti-retraction system, which prevents the release of debris and fluids that can accidentally be inhaled by healthcare professionals during clinical procedures [33]. They also recommend not to use intraoral radiographs; therefore, they propose the use of orthopantomography or CT if strictly necessary. The authors agreed on the need for four-handed work to reduce the risk of spreading the virus in the dental care unit, to manipulate the water-air syringe with extreme caution, and to use large-volume aspirators (41, 33].
- Rubber-dam use can be considered for aerosol-producing procedures, as airborne particles are reduced by 70% [43]. In radiography, extraoral radiography is favored over intraoral techniques to reduce saliva production and gag reflex [33].
- Operatory preparation: a negative pressure/airborne infection isolation room should be allocated for the treatment of any suspected COVID-19 patients to minimize the exposure of patients and staff [44].

Post treatment

- Doffing of PPE: an appropriate doffing sequence and disposal in designated bags should be followed as per local biomedical waste protocols.
- Glasses and face-shields must be washed and disinfected after each procedure.
- Because coronaviruses lose their viability significantly after 72 hours, many organizations have promoted a rotation and reuse strategy. It involves acquiring a set number of N95 masks (at least 5 as per the CDC), and rotate their use each day, allowing them to dry for long enough that the virus is no longer viable [45]. However, N95 respirators used during aerosol-generating procedures or those contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients should be discarded [44].
- Fumigation is not practical for dental operatory; how-ever, measures such as mopping the floor with 1% sodium hypochlorite and disinfecting waterlines with 0.01% sodium hypochlorite can help reduce the risk of cross infection [46].

- All biomedical waste about patient care should be carefully disposed of from time to time through an authorized biomedical disposal agency.
- The WHO guidelines recommend the use of 5% sodium hypochlorite, with a 1:100 dilution, to be applied on surfaces for an average action time of 10 min; constant ventilation of the dental surgery room is also recommended [29].
- The various groups of disinfectants, such as propanol, sodium hypochlorite, and ethanol, in percentages ranging from 80 to 95% (as a hand rub) or 62 to 71% (as a surface disinfectant) , can reduce SARS-CoV-2 load to below recording levels in a variable lapse of time. Pertinent papers on this topic are limited [47].
- The Spanish Dentists Council suggests the use of 1% sodium hypochlorite for the disinfection of the impressions. The action time of the disinfectant varies depending on the material used: 10 min for alginate, and 15–20 min for elastomers.

CONCLUSION

COVID-19 has spread worldwide in a pandemic way and infection control measures are mandatory to limit contagion, especially for healthcare professionals who meet potentially infected patients. In this unprecedented time, events are unfolding rapidly, and hence, all dental practitioners should be abreast of the latest news and guidelines following the regulatory bodies. The dentists should be familiar with its signs and symptoms and take necessary precautions to identify the patients at high risk to limit the further spread of the fatal disease.

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