

# Pediatric Dentistry at the Time of COVID-19 Pandemic: A Review of Literature and Guidelines

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**Objectives** The aim of the present study was to review practical considerations, special precautions, and novel challenges of pediatric dentistry at the time of coronavirus disease 2019 (COVID-19) pandemic.

**Methods** PubMed (Medline), Scopus, and Google Scholar were searched for related articles. The websites of organizations related to public health and dentistry were also electronically searched. All searches were performed before November 2020.

**Results** In this paper, the findings were categorized as: (I) how to triage patients, (II) waiting room modifications, (III) how to use personal protective equipment, (IV) mouthwashes, (V) how to minimize aerosol production, (VI) how to manage routine dental treatments, (VII) pharmacological management, (VIII) how to manage pharmacological sedation and general anesthesia, and (IX) coincidence of COVID-19 and seasonal influenza. Some lifestyle changes during the pandemic which are important to know for pediatric dentists were also discussed.

**Conclusion** The emergence of COVID-19 has brought novel challenges for dental professionals. Pediatric dentistry is even more important because children can be asymptomatic carriers of the virus since they usually present mild or no symptoms. In addition to the standard precautions, pediatric dentists should implement special precautions to prevent disease transmission.

**Keywords** Child; COVID-19; Dentistry; Pediatric Dentistry; SARS-CoV-2.

## Introduction

The coronavirus disease 2019 (COVID-19) is an acute respiratory disease caused by a novel virus known as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).<sup>1</sup> It was reported for the first time in December 2019 in Wuhan city of China, and on January 30, 2020, the COVID-19 was announced as an international concern by the World Health Organization.<sup>2,3</sup>

Clinical symptoms include fever, dry cough, malaise, shortness of breath, sore throat, and headache. In some cases, diarrhea and vomiting are also present. Severe manifestations of COVID-19 include acute respiratory distress syndrome, septic shock, and death.<sup>4,5</sup> The main transmission routes of the virus are direct transmission through coughing, sneezing, talking, and direct contact with less than 2 m distance and at least 15 minutes of exposure time or indirect transmission through the exposure of oral, nasal, and ocular mucous membranes to contaminated surfaces.<sup>6-9</sup>

Since dental practitioners are in frequent and close contact with patients' oral fluids and blood, and handle sharp instruments, a great risk of transmission and cross-infection exists in dental offices. Therefore, dentists and patients are at high risk of being infected.<sup>6</sup> Another reason why dental procedures are high risk is that the virus binds to the angiotensin-converting enzyme 2 receptor which is extensively expressed by the oral mucosa epithelial cells; thus, the viral load would be considerable in the upper respiratory system. Therefore, when dental professionals use high-speed handpiece and ultrasonic scalers, they produce virus-laden droplets and aerosols.<sup>6,10</sup> Pediatric dentistry is even more important because children

are asymptomatic carriers of the virus since they usually present no or mild symptoms.<sup>11</sup> It might be because of the stronger innate immune system, healthy respiratory tract (smokeless, stronger self-healing capabilities), lower frequency of underlying comorbidities, having active thymus which is responsible for T-cell maturation, being in the age of vaccination which causes the presence of memory T-cells in their blood, and fewer number and immature angiotensin-converting enzyme 2 receptors.<sup>12</sup> Moreover, children are highly susceptible to seasonal influenza, which causes the spread of the influenza virus in the community.<sup>13</sup> As a result of the coincidence of seasonal influenza and COVID-19 pandemic, the resources needed to combat the pandemic are endangered, and greater burden is placed on the healthcare systems.<sup>14</sup>

The aim of the present study was to review practical considerations, special precautions, and novel challenges of pediatric dentistry at the time of the COVID-19 pandemic.

## Methods and Materials

An electronic search was performed using PubMed (Medline), Scopus, and Google Scholar databases to find relevant articles. Specific search terms included "coronavirus", "severe acute respiratory syndrome coronavirus 2", "2019-nCoV", "SARS-CoV-2", "SARS-CoV", "MERS-CoV", or "COVID-19" together with "children", "dentistry", "pediatric dentistry", "dental hygiene", "influenza", "flu season", "nutrition", and "lifestyle". The electronic search of databases was complemented with the search of websites including the American Dental Association (ADA), American Academy

of Pediatric Dentistry, Royal College of Surgeons, Centers for Disease Control and Prevention, and World Health Organization websites. All searches were performed before November 2020.

## Results

### Triage:

Managing dental emergencies, and treatments under general anesthesia in dental clinics and hospitals are two important topics in pediatric dentistry that both indicate the

necessity of accomplishing triage and the importance of the pediatric dentist's proper clinical judgment at this time when there is a shortage of personal protective equipment (PPE) and high risk of infectivity.<sup>15</sup> Dentists should follow guidelines that instruct them to concentrate on emergency and urgent dental treatments and postpone elective treatments, especially aerosol-generating procedures, until further notice. The ADA classification of treatments based on the need for immediate intervention is mentioned in Table 1.<sup>16</sup>

**Table 1-** ADA classification of treatments based on the need for immediate intervention <sup>(17)</sup>

Dental emergencies (potentially life-threatening which require immediate intervention)	Urgent dental care (not life-threatening; however, they have the potential to grow into a true emergency if immediate intervention does not implement)	Routine or non-urgent dental procedures
Uncontrolled bleeding	Severe dental pain from pulpal inflammation	Initial or periodic oral examinations and recall visits, including routine radiographs
Cellulitis or a diffuse soft-tissue bacterial infection with intra-oral or extra-oral swelling that potentially compromises the patient's airway	Pericoronitis or third-molar pain	Routine dental cleaning and preventive therapies
Trauma involving facial bones, potentially compromising the patient's airway	Abscess, or localized bacterial infection resulting in localized pain and swelling	Orthodontic procedures other than those to address acute issues (e.g., pain, infection, trauma) or other issues critically necessary to prevent harm to the patient
	Tooth fracture resulting in pain or causing soft tissue trauma	Extraction of asymptomatic teeth
	Dental trauma with avulsion/luxation	Extraction of asymptomatic teeth
	Dental treatment required before critical medical procedures	Aesthetic dental procedure
	Final crown/bridge cementation if the temporary restoration is lost, broken, or causing gingival irritation	
	Biopsy or abnormal tissue	
	Extensive dental caries or defective restorations causing pain	
	Suture removal	
	Denture adjustments or radiation/oncology patients	
	Replacing temporary filling on endo access opening in patients experiencing pain	
	Snipping or adjustment of an orthodontic wire or appliances piercing or ulcerating the oral mucous	

Since dental procedures for suspected/confirmed cases of COVID-19 must be carried out in a room equipped with negative pressure in a hospital, and are not permitted to be performed in a dental clinic, dentists should screen all patients seeking dental treatments at the dental offices. This screening is performed in two steps. The first step is tele-screening, and the second step is pretreatment screening.

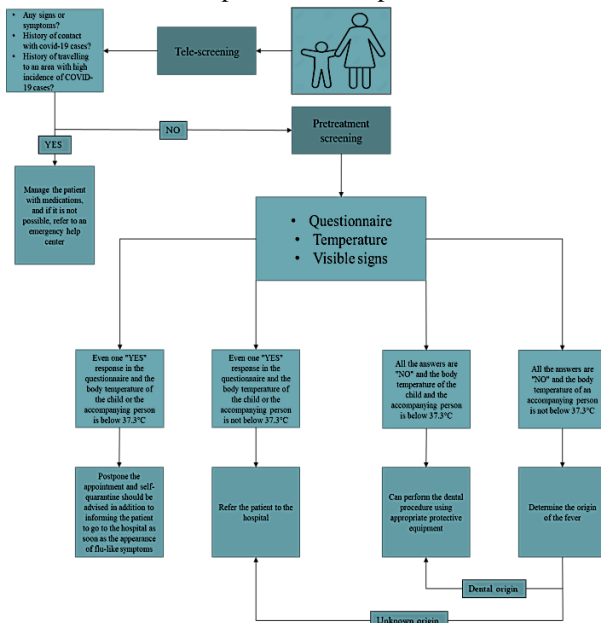
In tele-screening, the dentist should try to talk to parents on the phone to ensure general health status of children and parents, and ask about the child's dental problem. During the phone-triage, the dentist asks the parents if the child or other family members have experienced any symptoms such as vomiting, fever, cough, shortness of breath, diarrhea, headache, myalgia, loss of sense of taste and smell, history of close contact with symptomatic or confirmed cases of COVID-19 and if they have traveled

to an area with high incidence of COVID-19 within the past 14 days. If there is a "yes" answer to any of these questions, patients should be managed by medication (analgesics and/or antibiotics) whenever appropriate. If there is an emergency, the patient should be referred to an emergency health center. If the answer to all questions is "no", the child and the accompanying person can come to the dental clinic to complete the examination.<sup>17</sup>

In pretreatment screening, after filling out the questionnaire by the person accompanying the child, body temperature and clinical signs and symptoms of respiratory problems must be assessed. Figure 1 illustrates all the steps for screening of patients before performing emergency and urgent dental care in a dental office.<sup>6</sup>

Because of the long incubation period (2-14 days), the existence of false-negative cases in diagnostic tests, nature of the SARS-coV2 disease (mild or asymptomatic

in many cases, especially in children), and considering the fact that most dental procedures produce aerosols, implementing greater precautions is necessary to protect the dental healthcare personnel and patients.<sup>5,18</sup>



**Figure 1- Flowchart of patient screening for emergency and urgent dental services in the office**

#### Waiting room:

The waiting room should be modified to minimize the risk of virus transmission. In this regard, providing proper ventilation in the waiting room and hand disinfectants for patients, placing chairs six feet apart from each other, and limiting the number of daily appointments can be helpful. Table 2 summarizes some modifications which should be implemented in the waiting areas.<sup>19</sup>

**Table 2- Recommended modifications for the waiting room<sup>21</sup>**

1. Prepare ventilation by opening the windows and using a medical-grade air purifier as recommended by the manufacturer.
2. Put garbage bins to prevent contamination of the environment.
3. Eliminate potentially virus-carrying objects (pens, magazines, toys, etc.).
4. Design some posters for educating patients about how they should wash their hands, alert them to cover their noses and mouth with a piece of tissue or an elbow while sneezing or coughing, and immediately throw used tissue away in the garbage, inform patients to talk as little as possible to reduce droplet formation.
5. Provide hand disinfectant with at least 70% alcohol in the waiting area.
6. Frequently disinfect surfaces including chairs, desks, doorknobs, etc., using chemical disinfectants such as 62-71% ethanol, 0.5% hydrogen peroxide, and 0.1% sodium hypochlorite.
7. Install a clear partition at the front of the reception desk to avoid close contact with suspected patients.
8. Limit the number of patients to avoid crowding and provide social distance at two meters between patients and minimize overlapping dental appointments.
9. Patients and their accompanying person must wear medical masks and use a shoe cover, they should also be requested to wash their hands with water and soap and then sanitize their hands with alcohol-based disinfectant.
10. Ask patients to wait in their vehicles or outside the dental clinic, then inform them when it is their turn.

11. Place chairs six feet apart from each other and set physical barriers between them.

#### PPE:

The dental office staff, especially the dentist himself/herself, often have a close and face-to-face contact with the patient while the patient does not wear a mask during the procedure; this proximity also takes several minutes. On the other hand, aerosols are produced as a result of using a high-speed handpiece, rotary motors, and ultrasonic scalers in most dental procedures.<sup>20</sup> All children and their companions should be considered suspected for COVID-19; thus, using PPE is highly important. PPE includes gloves, masks, surgical gowns, goggles, face shields, head-covers, shoe covers, and dental uniforms. Goggles and a dental bib for the patient are recommended.<sup>21</sup>

Some examples of common mistakes in PPE application are removing the mask, goggles, or full-face shield by touching the outer surface without using strings, removing the mask or taking off the white coat without changing the contaminated gloves, using medical masks instead of N-95 filtering face-piece respirator during aerosol-generating procedures, not washing hands before and after wearing gloves, wearing eyeglasses or loops without goggles or a full-face shield, and wearing gloves immediately after using alcohol-based hand sanitizers which would decrease the resistance of gloves to tearing.<sup>7</sup>

#### Mouthwash:

Using pre-procedural mouth rinses such as 1% hydrogen peroxide or 0.2% povidone-iodine is highly recommended due to the possible reduction of viral load in the oral cavity.<sup>6</sup> In comparison with other mouthwashes, 0.12% chlorhexidine gluconate has little or no effect on the coronavirus.<sup>22</sup>

Since children under the age of six are not capable of rinsing a mouthwash, a gauze pad soaked in the solution can be used. After isolation with rubber dam and access cavity preparation, it is recommended to use the mouthwash pad on the teeth.<sup>23</sup>

#### Strategies to minimize aerosol production:

Dentists should make some changes in treatment procedures to reduce aerosol production in dental clinics. As a result, the risk of virus transmission from patients to dental staff and vice versa would decrease, and risk of cross-infection between patients is also minimized. Some of the recommended changes are as follows:

1. If possible, use extraoral radiographs (cone-beam computed tomography, or panoramic radiography) instead of intra-oral types to prevent stimulation of the gag reflex and coughing.<sup>24</sup>
2. Use rubber dam and high-volume saliva ejector, especially in aerosol-generating procedures. Handle saliva

ejector in the child's mouth with caution to prevent the gag reflex.<sup>25</sup>

3. Minimize the use of rotary instruments and dental handpieces. If possible, use mechanical agents (e.g., Carisolv) or hand instruments (e.g., excavator) for caries removal. In cases that handpieces must be used, for example, preparation of access cavity for a caries-free cracked tooth with spontaneous pain, the patient should be scheduled as the last patient of the day and a rubber dam should be necessarily used.<sup>24</sup>

4. Use handpieces with anti-retraction valves to prevent cross-infection followed by retraction of the patient's blood and saliva into the air and water lines of the dental unit.<sup>6</sup>

5. Do not use the air-water spray or three-way syringes. If necessary, discharge them for 30 seconds between patients.<sup>26</sup>

#### Caries management:

Due to aerosol production while using high-speed handpiece for caries removal, alternative techniques which are minimally invasive should be implemented. Minimally invasive treatments are divided into two categories of non-invasive (without caries removal) and minimally-invasive (caries removal with hand instruments).

For initial caries, pediatric dentists can use a non-invasive treatment such as sodium fluoride varnish, silver diamine fluoride, or casein phosphopeptide amorphous calcium phosphate.

For severe caries, pediatric dentists can use minimally-invasive treatments such as silver diamine fluoride, interim therapeutic restoration, atraumatic restorative treatment, chemo-mechanical techniques, laser (sub-ablative), and the Hall technique.

For deep caries causing pulp exposure, pediatric dentists can use hand instruments, electric-powered micro-motors, and handpieces without air-water spray for root canal treatment or extract the primary tooth depending on the child's age and tooth prognosis.

If the treatment plan includes extraction, a supine position is recommended to avoid close contact with the child's respiratory tract.<sup>25, 27</sup>

#### Trauma management:

Orofacial injuries are a common emergency in children that require immediate intervention. Traumatic injuries include avulsion, severe luxation, crown-root fracture, complicated crown fracture in permanent teeth, and pulp exposure or severe luxation in primary dentition which has a risk of airway obstruction. Due to tooth mobility, pediatric dentists should manage such emergency conditions as routine, while considering that these procedures are aerosol-generating, and high level of protection is necessary.<sup>28</sup>

#### Pharmacological considerations:

Most dental treatments are restricted to emergencies such as orofacial infections during the COVID-19 pandemic, which need an antibiotic prescription. Because of the long half-life of azithromycin, it is one of the most common medications used for children who do not cooperate well. Due to the possible effectiveness of azithromycin in management of COVID-19, dentists should prescribe it with percussion so as not to cause drug resistance or shortage of this medication.<sup>29-31</sup> Considering the increased tendency of dentists and also patients to pharmacological management of dental pain in the pandemic era, dentists need to keep their pharmaceutical knowledge up to date. It has been said that use of nonsteroidal anti-inflammatory drugs may be harmful, but up to now there is no absolute evidence that taking ibuprofen or other anti-inflammatory painkillers would aggravate the COVID-19.<sup>32</sup>

#### Dental phobia, pharmacological sedation, general anesthesia:

Dental procedures and dental setting environments are potentially stress-causing due to experience of pain (physiological) and presence of dental phobia and anxiety in some patients (psychological).<sup>33</sup> The COVID-19 pandemic has intensified this problem. Pediatric dentists should manage the anxiety of children and parents to preserve oral health and prevent life-threatening conditions that need the dentist's immediate attention.<sup>34, 35</sup>

Non-pharmacological techniques are an appropriate approach for anxiety management, improving the children's cooperation, and preventing the child from crying which produces aerosols. Pharmacological interventions and nitrous oxide (N<sub>2</sub>O) inhalation are not recommended because of aerosol generation, having a potential risk of requiring basic life support measures including manipulation of the airway and consuming hospital supplies and manpower. Only in dental settings where the safety of equipment is properly ensured (i.e., face mask is sterilized and components are used once and then discarded), N<sub>2</sub>O inhalation sedation can be used.<sup>23, 36</sup>

In non-severe cases in which general anesthesia is elective, general anesthesia should be postponed during the pandemic due to the risk of viral transmission for anesthesiologists and other healthcare workers since aerosol generation occurs during airway management (e.g., intubation, extubation, and positive-pressure ventilation via mask) and also exposes them to mucous secretions. Consuming vital equipment and manpower which must be allocated to control COVID-19 and unnecessary exposure of children and parents to the contaminated environment of the hospital are among other reasons for this limitation.<sup>36, 37</sup>

#### Coincidence of COVID-19 and seasonal influenza:

Due to the co-occurrence of influenza and COVID-19 in the fall and winter, it is important to know the key

differences while they have similarities in clinical symptoms. COVID-19 spreads faster, causes more severe disease, takes longer to show symptoms, and has no definitive vaccine in comparison with influenza.<sup>(39)</sup> Although influenza vaccination has no preventive effect on coronavirus infection, the Center for Disease Control recommends it because of two reasons: (1) decreasing the burden on the healthcare workers and saving supplies which should be allocated to combat COVID-19 pandemic; (2) decreasing flu severity and the number of hospitalizations and deaths.<sup>14</sup>

The risk of COVID-19 in children especially those younger than five years is low while they are most vulnerable to severe influenza (particularly six months to two years of age). The role of children in spreading the influenza virus in the community is considerable. Therefore, immunizing them with the influenza vaccine is recommended.<sup>40</sup> All children over six months, parents or caregivers of infants under six months, and pregnant women should be vaccinated. Needless to say, all healthcare workers who frequently deal with children (e.g., pediatric dentists) should be vaccinated annually.<sup>40, 41</sup>

#### Lifestyle change considerations:

It can be stated that the COVID-19 pandemic has changed people's lifestyles related to eating, sleeping, transportation, stress level, and anxiety. Another aspect of these changes is the outbreak's impact on socioeconomic status.<sup>42</sup>

As a result of school closure and physical distancing, children's common daily physical activities such as commuting to school and extracurricular classes, and also exercising and playing in playgrounds and parks have been decreased or eliminated.<sup>(43)</sup> Pediatric dentists can have a positive effect on the psychological condition of children by informing the parents. It is better to recommend family members and caregivers to communicate and establish an emotional connection with children to mitigate their anxiety and fears related to the COVID-19 outbreak. Furthermore, playing games that require physical activity and the child's participation is beneficial.<sup>44</sup>

Spending most of the time at home during the quarantine period, decreased physical activity, and mental stress affect the sleep quality and the circadian rhythm. Parents may use high carbohydrate drinks to encourage their children to sleep. Early childhood caries is a possible consequence of this behavior.<sup>45, 46</sup>

Balanced nutrition is an important factor in boosting the immune system against viral infections.<sup>42</sup> Income instabilities, increased price of fruits, vegetables, and milk because of limitations in transportation, commuting restrictions to supermarkets and grocery stores, and reduction of imports are the main reasons for unbalanced diet during the lockdown.<sup>47, 48</sup> Evidence shows that vitamins A, C, D, B, and E, iron, magnesium, zinc, copper, selenium, and polyphenols have a great impact on modulating the immune system at different levels.<sup>39, 49-51</sup> Excessive consumption of sugary substances and saturated fats leads to obesity, weakening of the immune system, and increased risk of infection.<sup>39, 52</sup>

Oral hygiene is another important consideration. Pediatric dentists should emphasize the importance of toothbrushing twice a day and also limiting the daily intake of snacks and sugar-containing foods.<sup>53</sup> Parents should also follow oral hygiene instructions since the possibility of bacterial flora transmission from mothers to children is high in the age of 3-5 years which can induce severe early childhood caries.<sup>54</sup>

## Conclusion

Dentists often have face-to-face and close contact with patients; thus, they are at high risk of exposure to infectious diseases. The emergence of COVID-19 has brought novel challenges and responsibilities to dental profession. Although in the early days of the COVID-19 pandemic children were mostly considered asymptomatic carriers, the prevalence of the disease among children has now increased, and deaths have also been reported in some cases. Furthermore, most of the time, children are asymptomatic carriers of the virus since they usually present mild or no symptoms. Hence, every person should be assumed potentially infected. Dental professionals must be fully aware of the COVID-19 transmission routes, how to diagnose patients with COVID-19, and how to protect dental staff and patients from cross-infection. On the other hand, the dentist's attention to lifestyle changes in children and their families is very important and valuable because these changes, directly or indirectly, can affect the oral health of children.

## Conflict of Interest

No Conflict of Interest Declared ■

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