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## Children and Youth Services Review

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# Dentistry for children during and post COVID-19 pandemic outbreak



## Sreekanth Kumar Mallineni<sup>a, c, \*</sup>, Jaya Chandra Bhumireddy<sup>b</sup>, Sivakumar Nuvvula<sup>c</sup>

<sup>a</sup> Department of Preventive Dental Science, College of Dentistry, Majmaah University, Al-zulfi, Riyadh Province, Saudi Arabia

<sup>b</sup> Pedodontics and Preventive Dentistry, Saraswati Dhanwantri Dental College and Hospital & Post Graduate Research Institute, Parbhani, Maharastra, India

<sup>c</sup> Department of Pediatric and Preventive Dentistry, Narayana Dental College and Hospital, Nellore, Andhra Prasdesh, India

ARTICLEINFO	A B S T R A C T				
Keywords: Children Covid-19 Pediatric dentists Dentistry	Background: During and post COVID-19 pandemic outbreak, it is essential for safeguarding this viral infection control and prevention in pediatric dental practices. The role of parents and pediatric dentist and their dental team requires specific guidance to deal with dental problems of children in the dental operatory during and post- pandemic outbreak of COVID-19 disease. <i>Purpose:</i> To report dentistry for children during and post COVID-19 pandemic outbreak. <i>Conclusions:</i> The present review highlights the clinical features, possible modes of transmission of COVID-19 in dental operatory, preventive strategies, emergencies that pose a significant challenge, and treatment strategies for dealing with children and parents during and post COVID-19 pandemic. Absolute measures for children during their visit to dental operatory, quality control for pediatric dental clinics, and additional preventive measures associated with examinations and management of dental problems in children have been covered in this insight.				

## 1. Introduction

Since January 2020, the new coronavirus disease (COVID-19) or Severe acute respiratory syndrome coronavirus 2 (SARS COV-2) became a significant global public health concern. Due to the transmission via particulate or droplet, the diagnosis and treatment of oral diseases carry a straight forward risk of infection in the clinical setting (Peng et al., 2020). To prevent cross-infection and the spread of the epidemic, most dental clinics worldwide have suspended routine oral/dental treatment clinics. Therefore, we offer recommendations on the best pediatric dental practice of infection prevention in pediatric dental operatory in dental hospitals and universities during and post COVID-19 pandemic outbreak.

Globally, approximately 50% of young children below six years suffer from dental caries, which ranks severe public health concern (Anil & Anand, 2017). There is a high demand for dental treatment resources due to the growing disease burden and shutdown of dental clinics. The fear of visiting a dental clinic during COVID-19 has created an underestimation of the pain and suffering of children (Guo et al., in press). The fatality rate of COVID-19 was less when compared to the incidence rate. Approximately 80.9% of children were asymptomatic or had mild pneumonia. The majority of children act as carriers or contact nuclei posing a massive threat to the disease's containment (Wang et al., 2020). Vertical transmission from mothers to their newborns is yet to be confirmed. However, postnatal transmission in neonates was described with an incubation period ranging from 2 to 14 days (Bhumireddy et al., 2020; Peng et al., 2020). The rate of asymptomatic carriers is as high as 17.9% (Mizumoto et al., 2020). The rate of contracting the disease from a contagious person to healthy people is 2.6-4.7, higher than SARS or MERS. Asymptomatic children can also transmit the disease and act as super-spreaders (Adhikari et al., 2020). Thus, physical (social) distancing has been encouraged as a single prime factor in flattening the incidence curve. Along with physical distancing, other measures should be followed to minimize the risk of transmission. Imperial College London has proposed home isolation of cases - (remain at home for seven days following the onset of symptom), home quarantine (all household members of symptomatic children remain at home for 14 days following the onset), physical distancing - (a broader policy that lowers the overall contacts made outside the household, school, or workplace), as well as closure of schools and universities (Lai et al., 2020). Moreover the role of parents, pediatric dentist and their dental team requires a specific direction to deal with the dental problems in children during and post-pandemic outbreak COVID-19 disease. Therefore the purpose of the present short communication was to report

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<sup>\*</sup> Corresponding author at: Pediatric Dentistry, Department of Preventive Dental Science, College of Dentistry, Majmaah University, Majmaah 11952, Saudi Arabia. *E-mail address:* s.mallineni@mu.edu.sa (S.K. Mallineni).

dentistry for children during and post COVID-19 pandemic outbreak.

#### 1.1. Clinical features

The clinical features of COVID-19 are not specific and resemble many other infections such as flu/ influenza, pneumonia, or similar diseases affecting upper and lower airway. Many children may not present noticeable symptoms, and some may offer a state of acute respiratory distress syndrome and multi-organ dysfunction. The typical clinical features include fever, cough, diarrhea, sore throat, headache, fatigue headache, myalgia, and shortness of breath. Conjunctivitis, skin rash have also been reported rarely (Namineni & Mallineni, 2020). These features mimic many other respiratory infections, and in a minor group of affected children, the disease can progress to pneumonia, respiratory failure, and death (Rothan & Byrareddy, 2020).

#### 1.2. Spread through respiratory droplets

The risk of viral spread increases among the pediatric dentists, assistants, and children via respiratory droplets through coughing and sneezing. A variety of touchable surfaces and instruments increases the risk of indirect contact transmission (Warnes et al., 2015). According to recent research, coronavirus can stay on inanimate surfaces from few hours to days and be destroyed in less than a minute by disinfectants such as sodium hypochlorite and hydrogen peroxide (Kampf et al., 2020). Another interesting finding is that coronaviruses can be deactivated within 5 min to one hour on copper brass surfaces (Fiorillo et al., 2020). Thus, a thin brass copper film covering can be used as a significant modification on all touchable surfaces such as door handles, tabletops, instrument trolleys, and other instruments (van Doremalen et al., 2020).

#### 1.3. Aerosol transmission

During the dental treatment of children, the use of a high-speed turbine handpiece, ultrasonic scaler, and three-way syringe may produce aerosols mixed with body fluids such as saliva and blood of children, water mist, droplets, and these aerosols increase the risk of transmission (Meng et al., 2020). Children and adolescents wearing active or passive orthodontic appliances may need to take the appliance in and out of the oral cavity multiple times, and the risk of indirect contact further increases. Due to the peculiarity of the child patient, there are some other risks of transmission; children cannot wear personal protective equipment (PPE) as required during dental visits. Especially, young children often have at least one accompanying person during the treatment, and all these may increase the risk of infection in the pediatric dental set-up.

#### 1.4. COVID-19 prevention and control measures

Pediatric dentists play a significant role in the elimination of pain and suffering during dental emergencies in children. American dental association (ADA) states that dental emergencies are potentially lifethreatening and require immediate treatment to stop ongoing tissue bleeding, alleviate severe pain or infection. Thus the entire dental team is at risk of acquiring and contacting the transmission of COVID-19 during the pandemic. Hence, the closure of private pediatric dental practice/dental institutions is not recommended. However, the aerosolgenerating dental treatment poses a significant challenge during this pandemic.

The modern concept of dental diseases focuses on prevention and considers oral health a prerequisite and essential guarantee for overall health. Parents should inculcate good oral hygiene and dietary habits to children from an early age, guide, and supervise them in their oral health management and disease prevention, which can avoid critical illnesses. Effective oral hygiene and cleaning measures include tooth

brushing and floss and discontinuing sleep time feeding. The occurrence of dental caries in children is related to the frequency of eating and food nature. Parents should reasonably plan children's diet and avoid highfrequency consumption of foods with high sugar content. Keep the child's nutrition balanced and prevent overeating. Guide children to develop regularity habits, get enough sleep, drink plenty of water, exercise correctly, maintain the right attitude, and enhance their body immunity. During this pandemic outbreak, children are restricted from playing indoor games, and they are more prone to primary or young permanent teeth trauma. Parents should be aware of excellent trauma protection for children. At the same time, parents should always remind their children to maintain good hand hygiene. Before and after eating, before and after handling the appliance, children need to wash their hands with liquid hand soap or soap under running water or use alcoholfree hand sanitizer to scrub their hands. Most of the dental hospitals irrespective of public, private, and the government had suspended regular non-emergency dental consultations. Still, the majority of the dentists providing only emergency dental treatments based on essentiality. Virtual professional consultations have been chosen by pediatric dentists to decide the appointment in the dental operatory. There was a significantly higher penetration rate in the utilization of teledentistry globally for routine consultations and parental counseling (Fig. 1).

### 1.5. Management of dental emergencies

Dental emergency refers to oral diseases that occur and develop rapidly within a short period and require immediate treatment. Dental emergencies are potentially life-threatening and need immediate treatment to stop ongoing tissue bleeding, alleviate severe pain or infection. Common dental emergencies include acute pulpitis, tooth trauma, oral and maxillofacial trauma, as well as oral and maxillofacial space infections. Due to higher play activity of school-age children, the young permanent tooth trauma is a typical emergency (Mallineni et al., 2020; Meng et al., 2020; Peng et al., 2020).

Emergencies (Meyer et al., 2019)

- Uncontrolled bleeding
- Cellulitis or a diffuse soft-tissue bacterial infection with intra-oral or extra-oral swelling that potentially compromises the child's airway
- Trauma involving facial bones, potentially compromising the child's airway
- Urgent/emergency dental care focuses on relieving severe pain and risk of infection, thus decreasing the burden on hospital emergency departments.

The following conditions require such attention, with as minimally invasive as possible intervention to reduce the risk of aerosol, splash/ spatter production

- Severe dental pain from inflammation of the dental pulp
- Pericoronitis or pain in the gums during a third-molar eruption
- Surgical post-operative osteitis, dry socket dressing changes
- Abscess, or localized bacterial infection resulting in localized pain and swelling
- The tooth fracture resulting in pain or causing soft tissue trauma
- Dental trauma with avulsion/luxation
- Dental treatment required before critical medical procedures
- Final crown/bridge cementation if the temporary restoration is lost, broken or causing gingival irritation
- Biopsy of abnormal tissue

## 2. Other urgent dental care

- Extensive dental caries or defective restorations causing pain
- Manage with interim restorative techniques when possible (silver diamine fluoride, glass ionomers)



Fig. 1. Teledentistry approach: (A) oral hygiene instructions through using Google meet and (B) counseling to parents using Facebook Messenger.

- Suture removal
- Denture adjustment in children on radiation therapy
- Removable appliance (prosthesis/ orthodontic appliances) adjustments or repairs when function is impeded
- Replacing temporary filling on endodontic access openings in children experiencing pain
- Snipping or adjustments of an orthodontic wire or appliances piercing or ulcerating the oral mucosa

#### 3. Routine or non-urgent dental procedures

- Initial or periodic oral examinations and recall visits, including routine radiographs
- Routine dental cleaning and preventive therapies
- Orthodontic procedures other than those to address acute issues (e. g., pain, infection, trauma)
- Extraction of asymptomatic teeth
- Restorative dentistry including treatment of asymptomatic carious lesions
- Aesthetic dental procedures

#### 4. Management of children in the dental operatory

Preventive measures should start even before the children enter the pediatric dental clinic. Introductory letters to parents and children on new regular, guidance on pre-appointment screening, in-office registration procedures, reception area preparation, a note on wearing mask and hand hygiene helps to maintain a smooth workflow. Direct nonemergency walk-in children should not be encouraged, and only confirmed appointments should be the priority. Teledentistry should be endorsed in preschedule of appointments for children in the dental operatory and teledentistry and pediatric could be considered as telepediatricdentistry. This telepediatricdentistry could be useful in counseling the children and their parents and in explaining oral hygiene practices (Fig. 1). We developed a questionnaire for parent and child to assess the essentiality of the management of dental problems and risk category of COVID-19 disease to schedule an appointment (Table 1). This questionnaire is highly recommended through teledentistry before the scheduling of appointment. If a patient is at high-risk AAA (advice,

analgesics and antibiotics) protocol could be suggested (2020). A proper triage and sorting, screenings at the reception area entirely depend on trained dental team personnel. Parents accompanying should be limited to one (Mallineni et al., 2020). Changes in the reception area during and post COVID-19 should be considered new normal. Although the childfriendly atmosphere helps in conditioning children towards treatment, reducing or restricting physical contacts in the play area remains a disadvantage. Irrespective of travel history, both child and parent should be asked about area of residence, nearby COVID-19 positive affected area, any known COVID-19 positive children, screened for symptoms if any, and if found suspicious, they should be referred to the nearby designated hospital. Modifications in reception area such as transparent barriers, reduced paperwork and promoting digital arena, physical distancing in waiting area, separate area for discussion of the treatment plan with the parent, and restricted play area prevents physical contact (Darwish, 2020). The pediatric dental team should be well equipped, should thoroughly explain about hand hygiene maintenance, wearing personal protective equipment (PPE), cough etiquette according to current expert authority recommendations.

Before the oral examination, a brief video modeling on PPE, with a child-friendly PPE, reduces anxiety. Povidone-iodine (1%) mouthwash gargle helps in reducing the risk of infection during aerosol-generating procedures (Ge et al., 2020). After the oral examination, nonemergency, elective procedures should be postponed. Informed consent with special mention to the risk of COVID-19 transmission, the selfcomplaint of any symptoms that may arise after dental treatment should be signed by the parent before the start of treatment. Advisory on "no to parental presence" for co-operative children can be a preventive measure. For un-cooperative/ anxious children, the use of PPE may further increase fear and anxiety, which may be alleviated by child-friendly PPE (Naga Sailaja, 2020). Most of the emergencies are associated with pain, may further increase the anxious behavior. Communication with the child may get hampered due to the N-95 mask, face shield, and PPE as the tone of voice, facial expression, body language is masked. Positive pre-visit imagery might help in alleviating fears. The use of protective stabilization might help reduce untoward movements during the treatment procedure, which may avoid unnecessary physical contact with surroundings (e.g. during LA administration). Pre-treatment assessment of pain may also give an idea of the behavior guidance or management

#### Table 1

A proposed questionnaire used or patients via teledentistry before the appointment.

Name:       Date:         Gender:       Age:         Query       Yes       No         Did your child or any family member have a history of exposure to COVID-19?           Did your child have a history of fever in the last 2-14 days?           Did your child have any symptoms like cough, difficulty breathing, diarrhoea, nausea, and body ache or loss of taste in the last 2-14 days?           Emergency paediatric dental-related questions       YES       NO         Do you have any underlying medical conditions?            If yes              Do you have any underlying medical conditions?              Do you have any welling with gums or face?  <								
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technique to choose because children with intense pain may directly be referred to sedation/ general anesthesia. We propose an algorithm for assessment of pediatric dental patients in the dental operatory (Fig. 2).

During the treatment process, children should wear appropriate PPE, including protective eye goggles. Use of rubber dam, high volume suction, extra-oral suction decreases the aerosol load. The generation of aerosols also depends on the type of treatment required (Ather et al., 2020). The main aim should be to avoid splash and splatter, limit the aerosols, avoid cough/ gag reflex inducing procedures such as intra-oral radiographs, the topical anesthetic spray/gel, and impression procedures. Dental scaling, if required, should be limited to hand scaling, and ultrasonic scaling should be deferred (Krithikadatta et al., 2020). During caries removal, chemo-mechanical caries removal should be preferred, but it may not be possible for enamel caries. The use of minimally invasive treatments may decrease the production of aerosols. Application of topical fluorides, interim therapeutic restoration, atraumatic restorative technique (ART), Hall technique of stainless-steel crown placement, indirect pulp capping, and silver diamine fluoride application minimize the aerosol risk in the pediatric dental operatory (Mallineni et al., 2020). It been suggested that rapid examination, prevention, and control of COVID-19 disease have been become the essential focus (Zhang et al., 2020) during the pandemic outbreak prior to seek an appointment. It is necessary to strengthen quality control management to isolate potential sources of infection, to cut off all routes of transmission, and to terminate cross-infection and transmission. In the treatment of soft tissue and maxilla-facial injuries, absorbable sutures must be preferred as it may eliminate the additional visit for suture removal. For cases with severe life-threatening injuries/situations, a CTchest may be preferred as the RT-PCR test is time-consuming (Bali & Chaudhry, 2020). Reaffirming the importance of oral self-care, diet, tooth brushing, dental floss, fluoride toothpaste, mouthwash use safeguards children against future unnecessary dental visits. Treatment may be deferred to extremely uncooperative children and advanced behavior management techniques such as sedation, general anesthesia may be preferred.

## 5. Conclusion

There is a necessity for more established guidelines and protocols to manage children in the dental operatory. Well planned management strategies really matter within the pediatric dental practice and are essential to maximise the safety of children, parents, pediatric dentists, and their team. Utmost care with available resources and guidelines is essential to ensure the quality care and the well-being of children during



Fig. 2. Proposed algorithm for the assessment of children in the dental operator.

#### and post COVID-19.

#### **Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### Appendix A. Supplementary material

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