

Oral Healthcare Management of Children after COVID-19 Outbreak

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ABSTRACT

The emergence of the novel 2019 coronavirus disease (COVID-19) pandemic has led to a significant challenge to healthcare professionals. Among all the healthcare providers, dental clinical setup is exposed to the generation of potentially hazardous aerosols which could be a point of cross-contamination. Dentists catering to pediatric patients need to take special precautions, as they have milder symptoms or could be asymptomatic and hence potential vectors for the transfer of infection. One needs to change the perspective to manage the oral health of children as a child's oral health presents specific problems that could be time-bound and hence need to be treated accordingly. These problems can be managed on one hand by preventive methods, and on the other by implementing specific protocols relating to the conditions that represent an emergency, or those situations that fall into the category of elective dental procedures. This article highlights the routes of transmission in a dental practice and focuses on the categorization of treatment for children based on treatment needs. It proposes a restructuring of the treatment protocol and hence shifting to minimal invasive or non-aerosol-generating procedures (AGP). These techniques are also proposed to be used even after the end of the current emergency period to minimize the aerosol splatter.

Clinical significance: The article highlights the protocol that needs to be followed after treatment categorization during and after COVID-19 pandemic.

Keywords: 2019 Coronavirus disease, Non-aerosol-generating procedures, Oral health prevention, Pediatric dentistry, Treatment categorization. *International Journal of Clinical Pediatric Dentistry* (2021): 10.5005/jp-journals-10005-1906

INTRODUCTION

In December 2019, there was a sudden surge in pneumonia cases in Wuhan, China. An enveloped RNA coronavirus was identified from samples of bronchoalveolar lavage of these patients which was confirmed as the cause of the disease. On January 7, 2020, the World Health Organization (WHO) named it as the 2019 novel coronavirus (i.e., 2019-nCoV). On February 11, 2020, WHO named the illness associated with 2019-nCoV as the 2019 coronavirus disease (COVID-19).^{1,2} This virus has led to a global pandemic and its cases are increasing at an alarming rate. As of June 16, 2020, the number of cases recorded was 7.82 million worldwide. Children constitute 2% of total cases.³

The characteristics of COVID-19 observed in children are still unclear. Though children belong to a vulnerable group, most of them remain asymptomatic or recover with minor symptoms unless they have underlying conditions. Thus, children could be asymptomatic carriers; hence, one needs to be cautious while treating pediatric patients in the dental operatory.

This article reports the current data available on routes of transmission of COVID-19 in a dental practice and proposes a categorization of dental procedures according to the treatment need. The article proposes to shift to non-aerosol-generating procedures (AGP) during and after the pandemic. These recommendations are based on relevant guidelines for general dentistry, but as the pediatric population differs in their symptoms, appropriate protocols are required to guide dental health professionals in treating children.

VARIOUS ROUTES OF TRANSMISSION OF COVID-19 IN A DENTAL CARE CENTER

Routes of transmission are the same in adults and children. 2019 coronavirus disease is known to be transmitted from

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person to person by respiratory droplets.⁴ The asymptomatic incubation period for infected individuals is 1–14 days.⁵ Individuals without symptoms are also known to spread the virus.⁶ Hence, asymptomatic children can transmit the infection to a more vulnerable population or dental personnel during treatment.⁷

The new coronavirus is known to enter the cells through the same path as the SARS-corona virus, i.e., through the human angiotensin-converting enzyme 2 (ACE2) receptors. These cells are found in abundance in respiratory tracts as well as the salivary gland ductal epithelium in the oral cavity.^{8,9} Till date, no cases of transmission from dental care have been reported in the literature, but considering the aforementioned factors, the dental setting does invariably carry the risk of transmission of viral infection.

The various routes of transmission in a dental set-up include:

Airborne Spread

Dental procedures are known to produce aerosols and droplets and transmission of coronavirus through this route is the most important concern in a dental setting. When a high-speed handpiece, ultrasonic scalers, or three-way syringe is used in the oral cavity, a large amount of aerosol/droplets mixed with patients’ saliva or blood is generated. These are small enough to stay suspended in the air for a longer period of time before they settle on surfaces in the clinic.^{10–12}

Contact Spread

Dentists frequently have direct or indirect contact with the contaminated oral mucosa, saliva, or contaminated dental instruments or surfaces in a dental clinic which can make a possible route to spread the virus.¹³ Pediatric dentists may also have contact with aerosols from an infected individual when a pediatric patient suddenly coughs, sneezes, or vomits during a dental procedure. The close proximity of the dentist and the child during treatment or repetitive talking of a child who is not wearing a mask may also lead to contact spread.

Contaminated Surface Spread

The virus is also known to persist on surfaces like metal, wood, or glass for a couple of days.^{14,15} Therefore, contaminated surfaces frequently touched by the dentist or the patient could be a potential source of infection. Children being curious to tend to touch surfaces or instruments in the operatory. Thus, an indirect transmission can occur from a child or *vice versa* when a pediatric dentist or the assistant touches a contaminated surface.

Therefore, management of children with modified treatment protocol after an outbreak of this pandemic is of utmost importance for the safety of the dentist as well as the pediatric patient.

MANAGING A PEDIATRIC PATIENT IN THE DENTAL CLINIC

Despite the rapid community spread of the novel corona virus in China, the emergency dental treatment care was reduced by only 38%.¹⁶ This proves that emergency dental care for the general population is very essential and hence measures need to be taken

to cater to this population. As healthcare providers, we have to alleviate the community spread of the disease through responsible actions while providing optimal dental care, and at the same time keeping ourselves, our staff, and patients safe.

Challenges in providing pediatric dental care during and after pandemic are:

- Incubation period and asymptomatic nature of the disease in children.
- Aerosol splatter and transmission of disease during various dental procedures.
- Dental fear in children—which might make the patient uncooperative during dental treatment.
- Parental separation in the operatory.
- Behavior management techniques involve frequent talking or physical contact with the child.
- Risk–benefit ratio for a treatment being provided.
- Emergency dental care, if at all required for specific cases.

Protocol for the pediatric patient requiring dental treatment:

- Tele-counseling and triage of patients.
- Categorizing the dental treatment (Table 1).
- Screening of the child as well as the accompanying person at the entrance.
- Using contact and airborne precautions—minimizing AGP and use of personal protective equipment (PPE).
- Infection control in the operatory.

It is proposed to categorize the dental conditions based on the urgency of treatment need. The purpose of this is to reduce walk-ins and hence massing of patients in the dental clinic.

It can be categorized as follows:

- **Emergency dental care**—involves the condition of dental origin that increases the patient’s death risk.
- **Urgent dental care**—involves dental condition that requires priority care but do not increase the patient’s death risk.
- **Elective dental care:**
 - Managed without AGP.
 - Managed with AGP.
- Home dental care.

Table 1: Categorization of dental procedures based on treatment need

<i>Emergency dental care (I)</i>	<i>Urgent dental care involving AGP (II)</i>	<i>Elective dental procedure (III)</i>		<i>Home dental care (V)</i>
		<i>With AGP</i>	<i>With non-AGP</i>	
Cellulitis due to dental infection—compromising swallowing or breathing	Trauma to permanent tooth	Stainless steel crown	Initial examination Enamel caries Enamel-dentin caries	Oral hygiene measures Brushing twice daily Use of mouth rinse
Luxation injuries Special healthcare needs children which may place them at additional risk if the condition is not treated.	Trauma to the primary tooth causing severe pain Severe pain due to irreversible pulpitis Space maintainer	Esthetic crown • Zirconia crowns • Strip crowns	White spot lesions Recall visits Preventive dental procedures: Pit and fissure sealants. Application of fluoride varnish. Extraction of grade III mobile teeth causing difficulty in eating.	Dietary counseling • Avoid frequent snacking and cariogenic food Prevention of orofacial trauma Promoting oral health through digital media.



RECOMMENDATIONS FOR PEDIATRIC DENTAL PRACTICE AFTER COVID-19 OUTBREAK

It is recommended to postpone all elective dental procedures for the child during the pandemic. Urgent dental care in pediatric patients is time-sensitive and lack of treatment could lead to long-term detrimental effects. Hence, treatment of conditions under emergency and urgent category should be kept functional during pandemic.

Non-aerosol-generating elective dental procedures could be an alternative to avoid deterioration of the existing lesion. This should be done with strict infection control measures and use of PPE as per the prescribed guidelines.¹⁷

The lockdown has led to an erratic schedule and varied dietary habits among children. This could lead to frequent snacking and consumption of caries promoting dietary habits, thus home care should be an important part of tele-counseling to avoid exacerbation of the existing condition. Healthy eating habits and brushing twice daily should be promoted to prevent the onset of caries.

For parents of Special Healthcare Need children, even a piece of telephonic advice about oral hygiene could have a significant impact on clinical outcome in long term. They may be advised to continue the medications prescribed as sudden changes in therapy might have a detrimental effect on the outcome. A regular telephonic follow-up can help to keep a check on the status of the condition and referral if required in case the condition worsens.

Once the pandemic is on the decline, one will need to change with the new normal of dentistry. The emphasis should be on preventive protocols, minimally invasive dentistry, and the use of chemo-mechanical methods of caries removal.

STEP-WISE PROTOCOL FOR MANAGING PEDIATRIC PATIENTS AFTER COVID-19 OUTBREAK

Tele-screening

To minimize the risk of exposure, it is recommended to avoid physical walk-ins in the dental setting. Thus, tele-screening and triaging can be done to identify patients (accompanying persons) with suspected COVID-19 before scheduling the appointment. During telephonic triage, decision-makers like pediatric dentists should assess the situation of the patient's symptoms and provide guidance based on the urgency.¹⁸ This should be done in a timely manner to prevent symptoms from worsening. Before physically appointing a patient to the dental clinic, it is necessary to ascertain the following things-

Three basic questions to ascertain status of the child/ accompanying person:

- History of contact with a suspected COVID patient/family member.
- Recent travel history.
- Specific symptoms of fever, cough, or breathlessness in any family member or the child.

If the answer is "YES", to any of the above questions—the dental treatment of the child should be deferred for 2 weeks and only pharmacologic management should be done for symptomatic relief. The dentist thus gets time to refer the patient to specialist or follow all precautionary measures if the patient is to be treated at a later point of time.

If the answer to the above questions is "NO", the patient can be scheduled for an appointment to the clinic.

Residential Status of the Child

It is proposed to consider the residential status of the child before the child is scheduled at the dental clinic. If the child stays in the red zone or containment area, the elective procedures can be deferred and at the same time, home care hygiene is advocated to prevent exacerbation of the symptoms.

Positive Pre-visit Imagery

It is recommended to provide parents with visual information like photographs of dental treatment or dental clinic before they visit the clinic through digital methods.¹⁹ This will acquaint the parents with the dental clinic and probable procedures that will be done on the child. Considering the present pandemic, positive images can also include dentists dressed in PPE, hence making the child accustomed to the dental operatory.

Pre-appointment Instructions

- Child and an accompanying person should wear the mask.
- Child should be accompanied by a minimum number of people.
- To avoid public transport.
- A brief summary of the treatment to be performed should be given to parents.
- Only child will be allowed to enter the operatory.

Patient Arrival at Clinic

Once, tele-screening confirms the well-being of the child, he is scheduled to visit the dental operatory.

On arrival:

- Evaluate the body temperature of the child and accompanying person using a non-contact forehead thermometer.
- Pulse oximeter—to detect oxygen levels and identify asymptomatic cases.²⁰
- Assess anxiety levels of the child—patients requiring behavior guidance with enhanced physical contact and multiple personnel can be deferred for further treatment.
- Arrange for washing hands near the entrance of the clinic.

Modification of Waiting Area

- Minimal patient contact material like toys, books, etc.
- Minimum or no waiting time in waiting area.
- If waiting time—arrangement of waiting area maintaining social distancing.

Patient Handling in the Operatory

For the clinical dental procedures, the RULE OF THUMB should be that all children should be considered as potential risk carriers.

Once the child has access to the dental operatory, the dental team plays a pivotal role to limit the risk of transmission. Considering the anxiety of children in dental operatory, one needs to create a relaxed and anxiety-free environment for the child.

Behavior Management

Behavior management is an essential part of pediatric dental practice. As conventional behavior management techniques involve frequent communication and physical contact with the child, we need to modify or use techniques that will have minimal communication or contact with the child. These include:

- **Distraction**—It is a common technique applied in dental practice which diverts the attention of a child from what may be perceived as an unpleasant procedure. It can be an audio distraction or an audio-visual distraction. The child can select his choice of songs or stories during treatment.^{21–23} It is a low-cost technique and does not interfere with dental treatment. It is easy to execute and easily acceptable by children. This technique partially occludes the environmental noise and hence could be a preferable method of behavior management with the least communication.
- **Positive reinforcement**—Anything that the child finds pleasant can act as a positive reinforcer. The most powerful reinforcers are social stimuli like facial expressions or short verbal praise.²⁴ While one cannot pat the child use of sign language could be an appropriate alternative.
- **Non-verbal communication**—It forms the key aspect of communication. There are various forms of non-verbal communication, which include—facial expressions, gestures, or appearance.²⁵ Modifying face masks such that the expressions are visible could be an innovative alternative. As PPE would form a significant part of the procedures in the current scenario, PPE could be customized in child-friendly colors and designs.

Dental Management

Aerosol-generating procedures should be avoided and non-AGP opted as far as possible. If the AGPs are undertaken in case of emergency treatment—the operator should wear the recommended PPE.¹⁷

Mouthwash

Recent studies²⁶ have indicated that chlorhexidine mouthwash is ineffective against the coronavirus. On the other hand, the virus seems to be vulnerable to oxidation and hence it is recommended to let the child rinse with an antiseptic solution before starting the procedure to reduce the bacterial load.

Hand Hygiene

Good hand hygiene should become a regular protocol in a dental clinic during and after the COVID-19 pandemic. Non-compliance with hand hygiene methods can pose a challenge to control the pandemic. A Chinese study recommends²⁷ “two before and three after” as a standard hand hygiene procedure emphasizing the oral health professional should wash their hands before examining the patient, before dental procedures, after direct contact with the patient, after touching the environment without previous disinfection, and after touching the patients’ oral mucosa or skin or after coming in contact with saliva or oral fluids. One should avoid touching the eyes, nose, and mouth while treating the patient.

Restructured Treatment Options after Pandemic

Shift to minimally invasive dentistry and preventive management could be an essential part of today’s dentistry.

- **Preventive protocol:** All children who are categorized as high risk of dental caries should have an application of sealants on occlusal surfaces of permanent molars.²⁸
 - Casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) can be used to treat white spot lesions.²⁹
- Treatment protocol:
 - Rubber dam application should be encouraged in all cases, but in the case of an uncooperative child, extraction may

be the preferred treatment option for irreversible pulpitis requiring pulpectomy.

- Multiple treatments in a single sitting could be a better alternative rather than frequent appointments.
- White spot lesions and enamel and dentin caries can be managed conservatively by using chemical agents like silver diamine fluoride (SDF), nanosilver fluoride, or silver nitrate. Silver diamine fluoride is known to arrest caries and simultaneously prevent the occurrence of new caries. The only disadvantage being that it stains the tooth black.³⁰
- Nanosilver-based preparations are gaining popularity as excellent antibacterial, antiviral and antifungal agents. Nanosilver particles are known to attach to cell membranes and penetrate the bacteria. They react with DNA and respiratory chain mitochondria to cause cell damage.^{31,32}
- Chemo-mechanical caries removal (CMCR) agents are an alternative method to conventional drilling. These involve chemical softening of carious dentin followed by gentle excavation to eliminate the outermost portion (infected dentin) leaving behind the affected demineralized dentin that can be remineralized and repaired.³² These could be suitable alternatives to the use of aerosol-generating devices.
- Elective sedation anesthesia procedures should be temporarily avoided during the pandemic phase. Inhalation sedation by use of nitrous oxide sedation can generate aerosols by a flow of gases through a semi-closed circuit and can reach the environment as the mask is not tightly sealed. Although the risk of aerosolization during nitrous oxide administration is only moderate, the dental personnel need to hold the mask directly over the nose and mouth of a potentially uncooperative patient.³³ Hence, it can be used with utmost precautions, and the task of mask placement and reservoir bag monitoring can be assigned to separate individuals during the procedure following infection control precautions.

General Recommendations to Treat Children in Dental Operatory

- Use of disposable devices such as mouth mirrors, syringes to prevent cross-contamination.
- Use of extraoral imaging or cone-beam computed tomography imaging, to avoid the cough or gag reflex caused due to intraoral imaging. When intraoral imaging is mandated, double barriers should be used for sensors to avoid perforation and hence cross-contamination.
- One can minimize the use of three-way syringes, ultrasonic equipment, and high-speed handpieces to reduce aerosol generation.
- High volume aspirators can be used to minimize aerosols during the use of high-speed turbine operations.
- Use of high-speed turbines with anti-retraction valves, which minimizes the return flow of oral bacteria.

As the pandemic continues in various stages, it will be difficult to imply the same guidelines in all cases. Hence, the pediatric dentist should exercise professional judgment and take an informed decision whether or not to provide treatment.

CONCLUSION

Dental practitioners providing treatment to pediatric patients should follow infection control measures of the highest standard

considering each pediatric patient to be high risk. Recommendations for treating the pediatric patients during this pandemic outbreak include:

- Triaging to categorize patients and positive imagery method is appropriate to alleviate anxiety levels of the patient.
- Modification of behavior management strategies remains the mainstay to instill a positive attitude toward dental treatment in children.
- The use of innovative technology to guide parents to evaluate oral health and detect dental problems at the earliest could become a norm in the future.
- Strategies that promote preventive dental behavior at home should be given prime consideration.
- Minimal invasive procedures that reduce aerosol generation should be practiced meticulously.

Thus, the end of the pandemic will mark the beginning of new approaches to be practiced in pediatric dentistry.

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