



PEDIATRIC DENTISTRY DURING COVID-19 PANDEMIC

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Abstract : In the context of a deadly pandemic still lurking to infect in the form of coronavirus, children's oral health care is of great concern for practicing pediatric dentists. As the pandemic subsided and lock-down measures relaxed, they started taking foods, leading to various oral health issues. Children are vulnerable to exposure to COVID-19 infections since they are usually not in the habit of locking themselves up at home. Numerous sources have pointed out that the vulnerability of children as 'asymptomatic carriers' of the virus may lead to the further spread of infections. However, the mortality rate is negligible. Nevertheless, providing preventive measures for children to secure better oral health hygiene with minimal intervention through information, caregivers' education, and tele-dentistry is crucial. To prevent cross-infection, it also is vital to follow strict protective protocols while treating child patients in dental clinics. The study was mainly conducted during the ravaging COVID-19 pandemic. Its article attempted to provide vital information concerning the management of pediatric patients during the coronavirus pandemic by observing protocols and preventive measures to prevent the further spread of coronavirus.

I. INTRODUCTION

The pandemic of COVID -19 has been a challenge for the whole world, including the scientific and medical society. The complexity of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is centered on the unpredictable clinical course of the disease that can rapidly develop, causing severe and deadly complications.¹ (SARS-CoV-2), the seventh human coronavirus, was first detected in December 2019 in Wuhan, Hubei province, China.² Since then, the virus has spread worldwide, and as of May 20, 2020, it has infected 4,806,299 people and caused 318,599 deaths. The World Health Organization (W.H.O.) declared it a pandemic on March 11, 2020. SARS-CoV-2 and SARS-CoV and Middle East respiratory syndrome coronavirus (MERS-CoV) causes severe pneumonia with a fatality rate of 2.9%, 9.6% and 36%, respectively. The other four human coronaviruses, OC43, NL63, HKU1 and 229E, generally cause self-limited disease with mild symptoms. Other symptoms, such as gastrointestinal symptoms, and severe outcomes like stroke, blood coagulation disorders and possibly hyper-inflammation, have also been seen in many cases.

Mostly, children do not show severe symptoms, unlike adults and death among children is negligible, but children in many countries have been subjected to the same social isolation as adults. The United States Centers for Disease Control and Prevention (CDC) reported that children under ten accounted for 1% of COVID-19. Out of 2,336,615 laboratory-confirmed cases reported to the CDC, only 4.5% were in children until June 24, 2020.³ Various studies have been going on to determine the role children play in transmitting the virus that causes COVID-19. Transmission by children quickly became an issue as school-going children had to report to schools as soon as the imposed lockdown ended, and whether it would be safe for the children to join the schools was of great concern. There has also been a risk of increased COVID-19 transmission due to gathering after the opening of schools.

Maintaining children's oral health becomes crucial during the COVID-19 pandemic by implementing specific protocols and preventive measures relating both to the pathologies of the oral cavity that usually exclude an emergency and to those clinical situations within pediatric dental emergencies. For both clinical situations, our main aim is to limit the spread of the disease and the onset of cross-infections. It calls for meticulous and highly effective infection control protocols in the dental environment of the

areas affected by COVID-19. It is also essential to progress on remote communication and education for better maintenance of children's oral health.

COVID-19 Virus and Its Pathogenesis

Coronavirus is an enveloped plus-strand RNA virus that belongs to the order family Corona viridae and is classified into 4 (four) primary genera: 1) Alpha coronavirus, 2) Beta coronavirus, 3) Gamma coronavirus, and 4) Delta coronavirus. Mammals and humans are affected mainly by the α and β variants. The γ and δ genera infect birds. According to various studies, the bat is considered one of the main reservoirs of the coronavirus.

The primary mechanism for SARS-CoV-2 infection is the binding of the virus to the membrane-bound form of angiotensin-converting enzyme 2 (ACE2) and the internalization of the complex by the host cell. ACE2, a glycoprotein and metalloprotease, exists in membrane-bound and soluble forms. The membrane-bound form contains a transmembrane domain which anchors its extracellular domain to the plasma membrane, whereas in its soluble form, it is cleaved and secreted, as the N-terminal ectodomain is barely measurable in circulation.⁴

The SARS-CoV-2 virus binds to a human cell receptor that expresses angiotensin-converting enzyme 2 (ACE2). After binding, a series of processes includes internalization, replication, and the release of new virions from the infected cell. The coronavirus comprises mainly four structural proteins: spike (S), membrane (M), envelope (E), and nucleocapsid (N). The spike protein is responsible for binding to ACE2 and causes membrane fusion via conformational changes in the cell membrane. This process affects target organs such as the lungs, digestive tract, heart, blood vessels, and kidneys, where ACE2 expression is very high. This, in turn, leads to local and systemic inflammatory responses involving the affected organ.

Characteristics of COVID-19 in Children

According to recent literature, in children, fever and cough are the most usual signs of COVID-19 after SARS-CoV-2 infection. Many studies conclusively confirmed the clinical impression that COVID-19 in children typically presents as a mild (37%) or moderate (45%) upper respiratory tract infection and is rarely severe or critical.

Viral shedding in asymptomatic cases was found in children aged 0-14 years and was considered asymptomatic carriers, and these asymptomatic carriers had a lower peak of immunoglobulin M (IgM) against COVID-19, but they have shorter ribonucleic acid (RNA) negative conversion. Zhang *et al.* compared the conversion of 12 days versus 16 days in pre-symptomatic and symptomatic COVID-19 patients.⁵

Luo *et al.* reviewed 4950 close contacts and examined them according to the contact mode and clinical characteristics. An unpublished study from Guangzhou, China, discovered a strong association between disease severity and COVID-19 transmission ($P < .0001$). The symptoms associated with an elevated risk of disease transmission were fever, but not cough, fatigue or myalgia. Viral transmission can also occur when individuals touch their eyes, nose and throat if the hand contains viral particles. Presently kindergartens and other primary and secondary educational institutions are implementing and promoting hygienic hand washing to counteract that risk.

Another study showed that 8 of 10 children were detected positive by reverse transcription-PCR (RT-PCR) on rectal swabs even though their nasopharyngeal testing was negative. It still needs much research to determine whether the faecal positivity by RT-PCR represents residual viral genomic material or an active viral replication capable of causing infection. The isolation of SARS-CoV-2 from faecal samples of COVID-19 patients and the demonstration of viral nucleocapsid protein in gastric, duodenal, and rectal epithelia indicate that the virus actively infects these gastrointestinal glandular epithelial cells, which means the faecal-oral route of transmission is also possible.⁶

COVID -19 RISK FACTORS WITH PEDIATRIC PATIENTS

In a dental operator, oral fluids from the patient or contaminated dental instruments or environmental surfaces are one of the primary ways of spreading the virus to the dental surgeon, dental assistant, and other patients. The first gateway of infection is mostly by direct transmission through the respiratory droplets. The virus can get transmitted between the dentist, the dental assistant and the pediatric patients through the oral and nasal droplets released by coughing and sneezing or by the dental procedure itself. The suspended droplets containing the virus settle on the surfaces of the instruments with the consequent transmission; when the pediatric dentist, the assistant in the chair and other patients come into contact with the contaminated surfaces, an indirect transmission can occur. Pediatric patients also create additional transmission risks due to using removable orthodontic appliances or elements in fixed orthodontic therapies like inter-maxillary elastic bands, which increases contamination risks if handling is not done with all precautions. Another problem which is most commonly encountered is the difficulty for the child to use or manage personal protective equipment (PPE) during their medical/dental visits. Lastly, the presence of parents or attendants with whom the pediatric dentist has to interface increases the risk of spreading infection.

Interim Infection Prevention and Control Guidance for Dental Settings During the Coronavirus Disease 2019 (COVID-19) Pandemic

According to the Centers for Disease Control and Prevention, interim guidance is updated based on available information about COVID-19 and the current scenario. Dentistry includes using rotary dental and surgical instruments, such as air-rotor handpieces, ultrasonic scalers, and air-water syringes. Surgical masks protect mucous membranes of the mouth and nose from droplets suspended in the surrounding environment, but they fail to provide complete protection against the inhalation of infectious agents.⁶

Implement Tele dentistry

It is essential to telephone screen dental patients before they arrive in the dental clinic. If the patient reports any symptoms associated with COVID-19 non-emergency dental care should be avoided and delayed until the patient has ended isolation or quarantine. The dentist needs to assess the patient's dental condition and decide whether it is essential for the patient to be seen in the dental setting or whether it can be solved over tele dentistry. It should be advised to the patients and the person accompanying them to the appointment to wear a cloth face covering or facemask when entering the clinic and that they will undergo thermal screening for fever and symptoms similar to COVID-19.

Temperature check: Any patient with elevated body temperature should be advised not to visit a dental clinic, assuming they are potential virus carriers. The patient's body temperature must be measured with an infrared contact-free forehead thermometer, and a mandatory self-declaration form should be signed by the patient or by the parents accompanying the pediatric patients before they are taken for the dental procedure.⁷

Hand hygiene: Hand hygiene should be maintained before and after patient examination, dental procedures, coming in contact with the surroundings and equipment and contacting the mucosa, damaged wound, blood, or anybody fluid and secretion.

Precautionary measures for patient attendees: In the case of pediatric patients, the presence of parents or attendees is unavoidable. So, in that case, it should be minimized to a single parent. Since the attendee will be in the operator, they are considered to be the patient's primary contact. If they are allowed inside the operator, the attenders should be advised not to touch any of the operator surfaces with bare hands. In order to reduce the anxiety of the child during a dental procedure, a transparent barrier can be stimulated in the operator between the workplace and the attendee/ parent area, where the parent/attendee can be present to watch over the procedure.

Personal protective measures: An extra disposable protective layer should be worn on the outside over the autoclavable scrubs. Using three-layered face protection, including an N95 respirator, a surgical mask, and a face shield, is always recommended. A disposable head cap, latex/nitrile gloves, shoe covers, protective goggles, and face shield should also be used for additional protection.

Pre-operational antimicrobial mouth rinse: Many studies have suggested that chlorhexidine is ineffective against COVID-19. According to the National Health Commission of the People's Republic of China, oxidative agents such as 1% hydrogen peroxide or 0.2% povidone can be used as an antimicrobial pre-operational mouthwash.

Aerosol-generating procedures: Dental equipment like ultrasonic and sonic scalers, air polishing, air-water syringe, high-speed handpieces, air abrasion, and slow-speed handpieces produce aerosols. High-evacuation suction and dental dams are recommended in such cases to minimize droplet spatter and aerosols. The use of rubber dams, especially in cases where high-speed handpieces and dental ultrasonic devices are used, reduces the generation of contaminated airborne particles. Ventilation of the room in which the procedure is done is another concern. A well-ventilated room will facilitate the escape of the generated aerosols and droplets and reduce the chances of contamination.

Sterilization and disinfection: All dentists and other dental operators should practice efficacious infection control procedures. The dental handpiece should be sterilized externally with the help of autoclaving.

Radiographic examination: Extra-oral radiographs should be considered over intraoral radiographs whenever possible as intraoral techniques may induce coughing. While taking an intraoral radiograph, the film or sensor should be covered with an additional disposable plastic sleeve that is changed for every single patient.

Medical waste disposal: All medical waste, especially personal protective materials, should be marked while discarding. They should be transported regularly to the temporary storage area and must be disposed of following the required waste management protocol.⁸

Maxillofacial injury: In any case of severe oral and maxillofacial trauma, like a fracture of the maxillo-facial complex, the patient should undergo hospital-based care. Since the RT-PCR test requires specific labs and is time-consuming, a chest CT should be prescribed to exclude suspected infection.

Preventive Guidelines

In the present situation, when minimal dental check-ups and elective procedures are being performed, a high potential of an increased dental disease load arises. To keep this in check, specific preventive guidelines can quickly be followed at home. Parents should be advised to:

- Not to place a child to sleep with a bottle in his mouth.
- Not to use dipping pacifiers in sugar-containing foods, like honey, sugar, etc.
- Provide the child with a non-spill cup or sippy cup for drinking.
- Until one year, they must reduce the use of beverages like infant formula, and water other than breast- milk.
- Follow age-appropriate nutrition guidelines and stop bottle feeding.

Based on the caries risk assessment, patients can be categorized and treated according to their risk level. Preventive care can be given by 1,000 ppm fluoridated toothpaste, application of fluoride varnishes at specified intervals, and prescribing additional remineralizing agents for arresting/reversing white spot lesions.⁹

Post-Operative Period

The post-operative period involves the patient's care and supervision after dental procedures. Parents are instructed to be more vigilant in any changes in children after treatment. And in case of observing any signs and symptoms, be informed immediately. As well as implementing tele dentistry and triage protocols which provides a pragmatic approach to evaluate and record the oral health status postoperatively, improving the overall delivery of oral care.¹⁰

CONCLUSION

As dental healthcare professionals, one must be well informed about the disease and treat patients with maximum precaution during this challenging situation of the COVID-19 pandemic. There is a low prevalence of COVID-19 infection among children; however, the actual numbers are likely to be under-reported.¹¹ To reduce multiple appointments, preventive treatment care should be provided according to the patient's requirement. It is necessary to re-evaluate the procedures done by pediatric dentists taking into account the challenges in terms of disease contagion. Remote education/ tele dentistry with parents must be considered preventive measures for oral health and for home management of milder oral pathologies for which direct appointment and intervention by a pediatric

dentist is unnecessary or can be postponed.¹² However, in the cases of dental emergencies where immediate intervention is required, strict protection protocols of the subjects involved and surrounding disinfection becomes crucial and of utmost importance to minimize the risk of cross-infection and contamination. Thus, pediatric dentists are urged to update themselves with recent international and local institutional guidelines. Any practice modifications should be comprehended with professional clinical judgment.

Table 1 Summary of procedures

<i>Treatment procedure</i>	<i>Treatment choices</i>
Oral prophylaxis	1. Hand scaling
Management of carious lesion not involving the pulp	1. ART 2. SDF application 3. Hall technique
Management of carious lesions involving the pulp in primary teeth	1. Pulpotomy/pulpectomy (if abutment teeth is not present) 2. Extraction and space maintainer (if abutment teeth is present)
Management of lesions involving the pulp in young permanent teeth	1. Partial/complete pulpotomy 2. Root canal therapy
Esthetic management	1. Resin infiltration 2. Composite veneer/buildups
S. S. Crown	1. Hall technique
Traumatic dental injuries	1. Nonaerosol-generating procedures can be done—like pulp protection, application of flexible splints. Removal of splints can be deferred to a later appointment (refer pulp exposure for management of complicated fracture and esthetics for treatment concerning esthetics)
Orthodontics	1. Interproximal—IPR strips 2. Bonding—use water in syringe and gentle air blow using a chipblower 3. Debonding and changing the archwire—care to avoid splatters and fly away 4. Patient hand hygiene while inserting removable appliances
Oral surgical procedure	1. Extractions—intra-alveolar 2. Minor oral surgical procedures with proper caution 3. Avoid transalveolar extractions and trimming of bone

Adaptation of techniques and equipments

Affected patients	Adaptation of techniques and equipments
All children	<ul style="list-style-type: none"> • The air-water syringe must be used with care; and replace washing with a syringe with saline. • Preference for drying with cotton and gauze. • Minimize the use of the dental spittoon, with constant saliva suction, preferably with dental vacuum pump. • Attention and care in the handling medications and dental materials to avoid cross-infection.
Children who require protective stabilization	The companion must assist in patient restraint with mask and goggles. The assistance aims not to overload the dental staff, since contact with body fluids such as sweat is inherent to this type of approach.
Immunologically compromised children	They should be scheduled as the first appointment of the day, minimizing the risk of exposure to the environment, with increased attention to infection control and air turnover, given their increased susceptibility when infected by SARS-CoV-2, in addition to having medical contact for clarifications
Children who require urgent treatments	Such children should have their procedures maximized, preferably aimed at the adequacy of the oral environment, and avoiding recurring visits to the dental office.
Children with caries lesions with or without restorative needs	Consider the risk of dental caries, directing strategies for the treatment of active caries lesions in enamel and dentin; Use fluoride varnishes, silver diamine fluoride, pit and fissure sealants, temporary and atraumatic restorations, in addition to constant Reinforcement of the diet and use of fluoride toothpaste. Restorative treatment must be performed by quadrants under rubber dam isolation, reducing the production of saliva, aerosol and particles Contaminated by blood. If possible, choose non-aerosol-generating restorative procedures. Use high-speed handpiece without water spray; and give preference to manual instruments and low rotation

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REFERENCES

1. Giovanni Ponti, Monia Maccaferri, Cristel Ruini, Aldo Tomasi & Tomris Ozben (2020) Biomarkers associated with COVID-19 disease progression, *Critical Reviews in Clinical Laboratory Sciences*, 57:6, 389-399, DOI: 10.1080/10408363.2020.1770685.
2. Marco Ciotti, Massimo Ciccozzi, Alessandro Terrinoni, Wen-Can Jiang, Cheng-Bin Wang & Sergio Bernardini (2020) The COVID-19 pandemic, *Critical Reviews in Clinical Laboratory Sciences*, 57:6, 365-388, DOI: 10.1080/10408363.2020.1783198.
3. Rita Assaker et al (2020) Presenting symptoms of COVID-19 in children: a meta-analysis of published studies, *British Journal of Anaesthesia*, DOI: 10.1016/j.bja.2020.05.026
4. Prasenjit Mitra, Sanjeev Misra, Praveen Sharma COVID-19 Pandemic in India: What Lies Ahead *Ind J Clin Biochem* (July-Sept 2020) 35(3):257–259 <https://doi.org/10.1007/s12291-020-00886-6>
5. Ludvigsson JF. Children are unlikely to be the main drivers of the COVID-19 pandemic – A systematic review. *Acta Paediatr.* 2020;109:1525–1530.
6. Internet, Centers for disease control and prevention (2020) Interim Infection Prevention and Control Guidance for Dental Settings During the Coronavirus Disease 2019 (COVID-19) Pandemic
7. Xu Y, Li X, Zhu B, *et al.* Characteristics of pediatric SARS CoV-2 infection and potential evidence for persistent fecal viral shedding. *Nat Med.* 2020;26(4):502–505
8. Luzzi, V.; Ierardo, G.; Bossù, M.; Polimeni, A. COVID-19: Pediatric Oral Health During and After the Pandemics. *Preprints 2020*, 2020040002 DOI: 10.20944/preprints202004.0002.v1.
9. Vinay Rathore, Abhiruchi Galhotra, Rahul Pal, Kamal Kant Sahu (2020) *J Pediatr Pharmacol Ther* 2020;25(7):574–585 DOI: 10.5863/1551-6776-25.7.574
10. Luo L, Liu D, Liao X, *et al.* Modes of contact and risk of transmission in COVID-19 among close contacts. *medRxiv.* 2020.
11. Ummey Salma, Rahul VC Tiwari, Dr. Anil Managutti, Dr. Mahendra Azad, Preetham Ravuri, Sirisha Kommuri, Dr. Heena Tiwari (2020) The Challenging Perception of Pediatric Dental Practice Post COVID the New Normal *Saudi J Oral Dent Res* ISSN 2518-1300 (Print) |ISSN 2518-1297 (Online).
12. Ismail AF (2021) Managing pediatric dental patients during the SARS-CoV-2 pandemic. *J Int Oral Health* 2020;12:S80-4.