

Changing trends in paediatric dental practice post COVID; the new normal: A review¹Shrawani Mankar, ²Parag Dhake, ³Devendra Nagpal, ⁴Gagandeep Lamba, ⁵Purva Chaudhari, ⁶Kavita Hotwani^{1, 2}MDS Junior Resident, Dept of Paediatric and Preventive Dentistry, V.S.P.M Dental College and Research Centre, MUHS, Nagpur, India³Professor and Head, Dept of Paediatric And Preventive Dentistry, V.S.P.M Dental College And Research Centre, MUHS, Nagpur, India**Corresponding Author:** Shrawani Mankar, MDS Junior Resident, Dept of Paediatric and Preventive Dentistry, V.S.P.M Dental College and Research Centre, MUHS, Nagpur, India.**Citation of this Article:** Shrawani Mankar, Parag Dhake, Devendra Nagpal, Gagandeep Lamba, Purva Chaudhari, Kavita Hotwani, "Changing trends in paediatric dental practice post COVID; the new normal: A review", IJDSIR- March - 2021, Vol. – 4, Issue - 2, P. No. 491 – 501.**Copyright:** © 2021, Shrawani Mankar, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.**Type of Publication:** Review Article**Conflicts of Interest:** Nil**Abstract**

The spread of COVID -19 pandemic has caught the health of entire world in the fist and affected major health concerns for general public and doctors. This pandemic has caused difficulty in management of patients in every healthcare unit. The paediatric dental care will have no exception for it. It is precisely during the COVID-19 pandemic period that an adequate management of the oral health of children becomes a concern of crucial importance by implementing specific protocols relating to the pathologies of the oral cavity that normally do not represent an emergency and those clinical situations that fall within the category of paediatric dental emergencies. To reduce further consequences with COVID-19 infection a thorough knowledge of virus, its risk of transmission in clinical practices, clinical manifestations and the unknown challenges is necessary. The end of the pandemic will

mark the beginning of new methods of approach and management in paediatric dentistry. The purpose of this review article is to visualise the paediatric dental practices with effectively satisfactory results for betterment of children, their parents and paediatric dentist.

Keywords: COVID-19 · Paediatric dentistry · Aerosol generating procedures · Atraumatic restorative treatment · Non-restorative caries control. Behaviour management . tele dentistry**Introduction**

COVID-19 pandemic is undoubtedly posing the greatest challenge that paediatric dental care services ever had to face. But we can learn from this situation and benefit from this challenge. According to Occupational Safety and Health Administration (OSHA), dental health care personnel (DHCP) are placed in very high exposure risk category. These risks can be attributed to the aerosol

generating dental procedures (AGPs), handling of sharps, and proximity of provider to patient's oropharyngeal region.^[1] During this period, an adequate management of oral health of children becomes of crucial importance by implementing specific protocols relating both to the pathologies of the oral cavity that normally do not represent an emergency and to those clinical situations that fall within the category of paediatric dental emergencies. In both conditions, the main objective is to limit the spread of epidemic and the onset of cross-infections.^[2] Guidelines for pediatric dental patients by health authorities around the globe [American Dental Association (ADA), Centers for Disease Control and Prevention (CDC), Royal College of Surgeons of England (RCS) and Ministry of Health and Dental Council New Zealand (NZMOH)] have recommended suspending the dental procedures that are elective ones.

The American Academy of Paediatric Dentistry (AAPD) issued re-emergence practice checklist to help prepare paediatric dental practices to start seeing patients.^[3] The fact, that we being paediatric dentist should realize is an opportunity for constructive change, towards becoming more patient-centered and more importantly, more adaptive providers, equipped with a strategy for positive change. It is the right time to re-define and re-think our role, trying to learn the lesson that the current situation is teaching us and prepare well for the future, by changing our mindset and widening our resources. Although the relevant key expressions such as triaging, prioritizing, compromising and making difficult choices has become a daily reality in this pandemic time, these actions can bring an 'added value' and improve our services.

This review summarizes the changing trends in pediatric dental practice which can be utilised by paediatric dentists to minimise AGP and cross infections in the immediate

and near future while dealing with the COVID-19, thereby maintaining the oral health of children.

Pathogenesis

Spike (S) one of the structural proteins of coronavirus, consists of two functional subunits; S1 subunit which is responsible for binding to host cell receptor and S2 subunit which is for the fusion of cellular and viral membranes. Angiotensin converting enzyme 2 (ACE2) is identified as a functional receptor for SARS-CoV. Structural and functional analysis showed that the spike for SARS-CoV-2 also bound to ACE2. ACE2 expression is high in lung, heart, ileum, kidney and bladder.^[4]

Risk of transmission in dental settings

COVID-19 transmission in dental settings is mainly by the following pathways:

- **Direct transmission** through close contact between the dentist, dental assistant and children within 6 feet via saliva and respiratory secretions or through their respiratory droplets, which are > 5-10 µm in diameter. As suggested by Sabino-Silva et al. there is a minimum of three different pathways for COVID-19 to be present in saliva: from COVID-19 in lower and upper respiratory tract, that enters the oral cavity together with the liquid droplets frequently exchanged by these organs; COVID-19 present in blood can access the mouth via crevicular fluid; by major- and minor-salivary gland infection, with subsequent release of particles in saliva via salivary ducts.^[1,5]

- **Indirect transmission**, can occur when the droplets containing the virus settle on surfaces of the instruments with consequent transmission when contacted. Studies have shown that the COVID-19 virus can survive for up to 72 hours on plastic and stainless steel, and fewer than 24 hours on cardboard.^[5,6]

- **AGPs:** Standard dental procedures that include the use of rotating instruments and ultrasonic scalers, are associated

with generation of large quantities of aerosols ($> 5 \mu\text{m}$) and droplets from saliva and blood of the patient. These can remain suspended in air for long periods (hours) before settling on the surfaces. This poses potential risk of cross infection.^[7]

- While the previous transmission pathways are common to the treatment of any dental patient, paediatric patients present additional risks of transmission with the use of removable orthodontic appliances or auxiliary elements in fixed orthodontic therapies, such as the use of intermaxillary elastic bands, which entails risks of contamination if proper handling is not carried out.^[2]
- Also, the presence of caregivers, with whom paediatric dentist must unavoidably interface, will increase risk of infection.

Clinical Manifestations

Infants and young children are typically at high risk for admission to hospitals due to respiratory tract infection with viruses. In contrast, SARS-CoV-2 infection in children seems to have relatively milder symptoms than elder patients and infection runs in three major stages: a mild cold-like illness, a moderate respiratory syndrome and a severe acute interstitial pneumonia. The possible reasons for this difference between children and adults are as follows:

- Expression level of ACE2 may differ between adults and children. ACE2 are abundantly expressed on well-differentiated ciliated epithelial cells.
- Children have a qualitatively different response to the SARS-CoV-2 virus to adults. With ageing, continuous antigen stimulation and thymic involution lead to a shift in T cell subset distribution from naïve T cells to central memory T cells, effector T cells and effector memory T cells
- Simultaneous presence of other viruses in the mucosa lungs and airways, common in young children, can let

SARS-CoV-2 virus compete with them and limit its growth.^[4]

Though, children appear to be asymptomatic, they may contribute significantly to transmission. Median period of viral shedding of COVID-19, measured from illness onset to discharge period is shorter in asymptomatic patients compared with symptomatic patients (11 days vs. 17 days). Thus, prolonged duration of viral shedding in children with COVID-19 is associated with symptomatic infection. It can be assumed that, at this stage in the pandemic, all children and their parents/carers are potentially infective with the potential of cross-infection to healthcare workers.^[8]

Challenges

1. **Increase in burden of oral diseases:** During this epidemic period there is a possibility that the parents might not be willing for dental treatment of their children due to fear of getting infected at the dental office. This results in delaying of the treatment, thus increasing the burden of oral diseases. Also, children are forced to spend most of their time at home, which results in frequent snacking, consumption of soft and energy drinks containing high quantities of sugars. This can make enamel tissue less resistant to the attack of cariogenic bacteria and can also lead to Early Childhood Caries (ECC) in children aged between 3 and 5 years and rapidly worsening the clinical situation with easy onset of local abscess associated with painful symptoms.^[2]
2. **Added anxiety:** Anxiety can be seen in children as a result of the DHCP having to follow enhanced PPE protocols that may include a face mask and also lack of nonverbal communication. As children are being force to stay at home it might get difficult for them to cope up with outer environment which may also lead to dental anxiety. Also, the unpredictability of

COVID-19 infection in children, challenges in diagnosis of symptoms and reports of carrier status of SARS-CoV-2 presents challenge for paediatric dentists. Consequently, this may result in increased anxiety for the DHCP.

3. **Risks of Violence Towards Children:** American Psychological Association warns that due to stay at home orders, many children are at a greater risk for CAN. For some, home may not be a safe place due to stress on caretakers caused by reduced access to resources, job loss or strained finances. About the pandemic, children are also experiencing their own stress and uncertainty. Under stress, parents may be more likely to react to children's anxious behaviours or demands in aggressive or abusive ways. Lack of connection with school systems including counsellors and teachers has removed some safeguards that catch signs of maltreatment.^[3]

4. **Children with special health care needs (SHCN) and medically compromised children:** Dental pain may have a severe impact on these children and their families with evidence of adverse behaviours such as self-harming. Furthermore, children have increased risk of developing complications arising from any subsequent infection if the tooth is not treated. These conditions include those with an increased risk of bleeding from medication or health conditions, increased risk of infection (any immunocompromised state) and children at risk of infective endocarditis. Additionally, there are children with long term respiratory conditions, including chronic lung disease, cystic fibrosis, severe asthma etc. who are identified as being at a significantly increased risk from COVID-19.^[8]

5. **AGPs:** most of the procedures in paediatric dentistry are aerosol generating which increases the risk of infection.^[7]
6. **Efficiency of work:** Paediatric dentists will be using personal protective equipment (PPE) kits as a new norm for providing dental care to children. There are chances of dentists to get fatigue which might affect their efficiency to work.
7. **Financial burden** presented by lockdowns is also one of the challenges to be considered.

Post Covid era clinical recommendations: A new normal patient treatment

Table 1: What constitutes a dental emergency?¹⁰

Dental emergencies	Urgent dental care	Other urgent dental care
Uncontrolled bleeding.	Severe dental pain from pulpitis.	Extensive dental caries or defective restorations causing pain.
Cellulitis or diffuse soft tissue bacterial infection with intraoral or extraoral swelling, compromising patient's airway.	Pericoronitis or third molar pain.	Suture removal.
Trauma consisting facial bones, potentially compromising the patient's airway.	Surgical postoperative osteitis, dry socket dressing changes.	Denture adjustment on radiation patients.
	Abscess or localized bacterial infection resulting in localized pain and swelling.	Denture adjustments or repairs when function impeded.
	Tooth fracture resulting in pain or causing soft tissue trauma avulsion/luxation.	Replacing temporary filling on endo-access openings in patients experiencing pain.
	Dental treatment required prior to critical medical procedures.	Adjustment of an orthodontic wire or appliance ulcerating the oral mucosa.
	Final crown/bridge cementation if the temporary restoration is lost, broken, or causes gingival irritation.	
	Biopsy of abnormal tissue.	

Telescreening and Triage: Teledentistry can be of great assistance in current pandemic situation. Initial screening via telephone can be performed remotely at the time of scheduling appointments to identify children and their family members with suspected or possible COVID19 infection and to triage all patients in need of dental care. The "3As": Advise; Analgesics; Antibiotics (where appropriate) should be provided to patients by means of teledentistry in situations where dental treatment can be delayed.^[1,2,3,9] ADA provides the information that helps the paediatric dentist to decide what constitutes a dental emergency; however, dentists one's professional judgment in determining a patient's need for urgent or emergency care can also be used (Table 1).

After deciding patient's need to visit the dental clinic, next step should be to evaluate for signs and symptoms of COVID-19 infection. A detailed history should be obtained for COVID-19 infection which should include the questions related to any exposure of the patient to a person with known or suspected COVID-19, any recent travel history to an area with high incidence of COVID-19 or presence of any symptoms of febrile respiratory illness such as fever or cough, participation in any gathering, meetings, or had close contact with unacquainted people.^[1,2,8,11]

Upon patient arrival

The body temperature of patient should be measured using a contact-free forehead infra-red thermometer. If patient answers "no" to all questions and is afebrile, they can be treated by dentist following the recommended protocols. The ability to test patients for SARS-CoV-2 who need dental care is to be considered in order to restart dentistry in a sustainable way. Tests can be a strong tool to mitigate risks for patients and DHCP too.^[3]

Waiting area

Indian Dental Association (IDA) recommends posting visual alert icons like signs and posters at the entrance and in strategic places to provide patients with instructions (in appropriate languages) about hand hygiene, respiratory hygiene, and cough etiquette. Appointments should be scheduled such that social distancing can be maintained in waiting room. There should be 6 feet distance between two chairs. Another alternative for patient is to wait outside or in their vehicle and they can be contacted via telephone when it is their turn to be seen.^[12]

It is recommended that the patients avoid bringing companions to their appointment, except for the parents. It can be communicated to the patient at the time of scheduling an appointment. Every toy, book, puzzle and wooden block should be removed to prevent the spread of

infection. Attractiveness of physical environment in the waiting area can help to put children at ease and instill a positive attitude towards upcoming dental appointment. Environmental changes can be made by subdued lightning and relaxing music. Aroma therapy using Lavender or Orange oil can reduce anxiety and improve mood of children.^[13] Television in waiting room can be a good way to distract children. Displaying cartoons on television, might be a good idea as they do not require a sound track and no disturbance for the patients who are engaged in other activities.^[14] Use of smart phone gaming apps can help in desensitizing patients in waiting area itself.^[15,16] Once a child is comfortable in dental environment, coping with certain anxiety-producing stimuli becomes easier, and helps in delivering effective and efficient treatment.

During Treatment

The additional protective measures with **PPE** are recommended for the DHCP while treating patients as the main route of transmission of COVID-19 is through airborne droplets. Three levels of protection for the paediatric dentist can be distinguished as follows:

1. **Primary protection-** Wear a disposable cap; disposable surgical mask; work clothes with white coat; protective goggles or face shields and disposable latex or nitrile gloves
2. **Secondary or advanced protection-** Disposable cap, disposable surgical mask, protective goggles, face shield, white work coat with disposable or external surgical insulation clothing and disposable latex gloves
3. **Tertiary or enhanced protection** (contact with suspected or confirmed COVID-19 patients)- Special protective clothing (if not available, then use lab coat with an external disposable protective suit), disposable caps, protective goggles, face shields, disposable

surgical masks, disposable latex gloves and water proof shoe covers.

Good hand hygiene is one of the best ways to prevent the spread of infectious diseases. The WHO's "5 Moments" recommendations for hand hygiene should be followed by the DHCP undertaking or assisting in the procedure. [9,17,18]

The first and most important basic technique that all pediatric dentists can utilize to minimize the probability of SARS-CoV-2 cross-infection is by appropriate and skillful **behavior management**. Restless, crying children spread more aerosol compared to calm children. We all need to keep in mind the added anxiety that the child might have as a result of DHCP following enhanced PPE protocols. We should explain to them in simple terms, the value and use of this equipment. Another suggestion is to have a pin or a sticker that can be disinfected easily with the health provider's photograph displayed over the protective equipment. Colourful and cartoon printed PPE kits can be used. The children could be informed that they're going to see more of that 'Star Wars' look," with staff wearing gowns and face shields and masks. Having parents during treatment might be restricted moving forward. Proper coping techniques and communication between the paediatric dentist and the parents and their child are very essential. Desensitization of child can be done using smart phone dental application. Distraction can be achieved by using audio visual goggles and virtual reality distraction. [19,20]

Preprocedural mouth rinse with 0.2% povidone-iodine can be done. If the taste of povidone-iodine is not palatable to children then 0.5–1% hydrogen peroxide can also be used. This reduces the level of oral microorganisms in aerosols and spatter generated during dental procedure. [12,21]

Intraoral X-ray examination being the most common radiographic technique in dental imaging; can stimulate saliva secretion and coughing. Therefore, visual/tactile examination should be performed. [9] Extraoral dental radiographies, like panoramic radiography and cone beam computed tomography, can also be used as alternatives to avoid gag or cough reflex during the outbreak of COVID-19. [11]

Dentists should minimize the use of ultrasonic instruments, high-speed handpieces, and 3-way syringes to reduce aerosol-generation and prioritize the use of hand instruments such as spoon excavators in combination with chemo mechanical caries removal agents. However, if AGP needs to be performed, it should be scheduled as the last appointment of day. Four-handed dentistry with high volume suction for aerosols should be implemented along with regular suction. Also, the operating field should be isolated using rubber dam. This could significantly reduce airborne particles in approximately three-foot diameter of the operational field by 70%. Additionally, using high-speed turbines with anti-retraction valve, significantly reduces return flow of oral bacteria. [21] To avoid splatter, 8 o'clock position is avoided and working from 10 or 11 o'clock position is recommended. For restorative dentistry and endodontics procedures, it is advisable to use rotating instruments on contra-angle with low speed drilling and minimum water irrigation (avoid air-water cooling) or erbium laser if available in the dental office. [22]

For caries management as advised by the Italian Society of Paediatric Dentistry, minimally invasive dentistry, such as application of fluorides, sealants, silver diamine fluoride, atraumatic restorative treatment, intrinsic therapeutic restoration, resin infiltration, selective caries removal and Halls Technique should be taken in to consideration. [23] In an emergency management of an irreversible pulpitis, it would be advisable to limit

treatment to pulpectomy and dressing, although in most cases current techniques allow completing the endodontic treatment in a single visit. In extreme situations, an extraction followed by preformed space maintainers can be the preferred treatment option for children with pulpal symptoms (in deciduous dentition) to reduce the need for AGPs.^[24,25]

Removal/filter of contaminated air can be done by using devices like high volume evacuator (HVE) and high efficiency particulate arrestor (HEPA) filters. The use of upper room ultraviolet germicidal irradiation (UVGI) as an adjunct to higher ventilation and air cleaning rates can also be considered.^[7]

The AAPD recommends delaying seeing paediatric patients who require physical behaviour management, considering treating patients while on parent's lap with parent wearing a mask and having passed negative screening criteria, dedicating special hours in the day for such patients.^[3]

Post treatment

Recommendation from Public Health England advises vacating the surgery for 20 minutes after AGPs before re-entering to disinfect the room. However, this is dependent upon the air pressure. This is believed to reduce the air contamination to less than 1%. According to the standard operating procedures (SOP) one cycle of standard cleaning and disinfection of the entire treatment area (environmental surfaces) should be carried out after every patient.^[9] Local work surfaces; dental chairs; curing lamps; inspection lights and handles etc. should be cleansed between each patient with 0.1% sodium hypochloride or 70% ethyl alcohol.⁹ Potential sources of cross-infection such as intra-oral holders should be steam sterilized. Blood spillages should be disinfected with sodium hypochlorite at 0.5% (5000 ppm).^[9,26] Fogging should be done at the end of the day by using 20%

disinfecting solution (approximately 1000ml per 1000 cubic feet).^[26] Colour changing sterilization autoclave pouches should be necessarily used to keep all instruments disinfected, cleaned, packaged and properly stored.^[27]

Waste Management: Sharps should be burned immediately. Waste contaminated with blood and body fluids should be treated as clinical waste. Biomedical waste pertaining to patient care should be carefully disposed as per the Bio-Medical Waste Rules, 1998 amended from time to time through an authorised biomedical disposal agency by the State Pollution Control Board.^[27]

Management of traumatic dental injuries (TDI)

It is likely that TDI can present itself as an emergency to be managed during the COVID-19 epidemic. The condition associated with a favourable prognosis is represented by immediate reimplantation of an avulsed permanent tooth. In this case success rate is associated with the conservation of tooth in physiological solution or milk or saliva taking care to rinse it first with running water to decontaminate it before its introduction into the alveolus. In case of dislocation, the emergency treatment will consist repositioning and splinting with the adjacent dental elements. Treatment planning of dental trauma depends on age, traumatic severity of the dental tissue, development of the apex and duration of the dental avulsion. If the patient presents with contusion of the soft tissues of the face, debridement with removal of torn and contaminated tissues, disinfection and suturing is necessary. Patients with maxillofacial lesions require instead immediate hospitalization.^[28]

Oral health prevention

It is possible for paediatric dentist to use "social" digital platforms on which they can publish and disseminate behavioural guides for the protection of the oral health of children. The International Association of Paediatric

Dentistry has made the following recommendations for parents to maintain optimal oral health of children and avoiding dental clinic visits:

- Brushing at least twice daily with fluoridated toothpaste.
- Limiting snacking—not to eat more than five times during the day.
- Sugar-containing and sticky food should be avoided or consumed in moderation.
- Interruption of incorrect alimentary habits such as administration of bottles filled with fermentable liquids containing carbohydrates, pacifiers dipped in honey or sugar especially during the night for ECC prevention. Also, preserve oral health of parents to minimize risk of bacterial mother-child transmission.
- Parents should remain in touch with their paediatric dentist in case they have any queries about oral health or require assistance.
- In general, correct oral health must always be combined with a healthy lifestyle, thus contributing to a good general health. Therefore, physical activity at home, sleeping for an adequate number of hours, and proper nutrition and hydration throughout the day are strongly recommended.^[29]

Sedation

For management of patients with severe anxiety, or phobia, in urgent/emergency dentistry consultations, following can be recommended:

- In severe cases, dental care can be performed under general anaesthesia using resolutive techniques to solve patient's dental problem which can avoid returns or additional treatments in the short term.
- Dental procedures should not be performed under inhalation sedation with nitrous oxide/oxygen during the COVID-19 pandemic in order to mitigate aerosolization and virus spread and potential risk of

performing life support measures that involve handling of airways and use of hospital resources.

- Also, dental procedures should not be performed under pharmacological sedation as it must be considered that any procedure under sedation may require basic life support measures to control adverse cardiorespiratory events and would thus generate aerosols.^[30]

Management of medically compromised children and children with SHCN

These children should not attend a hospital or dental clinic environment unless the dental condition is considered 'life-threatening'.^[31] Consultation with the child's physician about the safety of being seen in the dental office should be done. Psychological methods and alternative techniques of behaviour management can be used when treating these patients. For treating severe cases of medically compromised patients, trying to balance and weight our clinical decisions and reviewing service capacity and patient's safety on a regular basis can be helpful. Additionally, special consideration should be given to the timing of the appointment in the schedule (1st appointments or special hours/days). A patient with acute/chronic oral medicine problems would vastly benefit from professional recommendations, provided over the phone, regarding treatment planning. Patients must be encouraged to continue to access health systems, particularly in case of emergency problems, and ensure that dental care is able to support them.^[8]

Conclusion

The need of an hour today is to accept this challenging situation as an opportunity to build a system more accessible to all, a system with prevention at its core. With a paradigm shift in dental care practice in progress during the current pandemic situation, Tele dentistry holds the prospects to attend the treatment needs of patients without

confrontation. It not only eliminates any chance of exposure to the virus but also decreases the service cost and helps in patient education and most importantly social distancing can be maintained. So, it becomes imperative that the DHCP embrace this fundamental tool and apply it to its full potential. Finally, since the COVID-19 situation continues to evolve day by day, paediatric dentists should keep a high level of awareness to help patients, minimizing risk and preventing viral spread.

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