

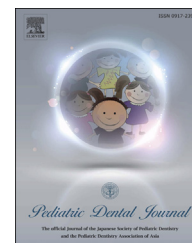


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Review

Paediatric dental care during and post-COVID-19 era: Changes and challenges ahead



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ABSTRACT

Background: COVID-19 is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus is transmitted through respiratory droplets and by physical contact from contaminated surfaces to the mucosa. Its route of transmission has caused a significant challenge in medical and dental healthcare.

Objective: This article aims to review the literature and information available on the provision of paediatric dental treatment during and post-pandemic and to provide specific recommendations on the safe provision of paediatric dental care.

Results: Children infected by SARS-CoV-2 have no or milder COVID-19 symptoms and are potential vectors in spreading the disease. Routine dental treatment is suspended in many countries because of the increased risk of cross-infection in dental practices. Only emergency dental care is provided for urgent conditions. It is necessary to gradually reinstate regular dental care to paediatric patients and maintain their good oral health. To control the disease transmission and maintain the oral health of the population, minimally intervention techniques that minimise or eliminate aerosol generation, plus comprehensive oral health preventive measures should be practised to safeguard safety at dental practices in this unprecedented time.

Conclusions: Robust infection control guidelines should be implemented in dental clinics to minimise the risk of infection and to ensure the safety of patients and staff during the pandemic. Three levels of preventive care should be practised to prevent oral diseases and improve children's oral health in this COVID-19 era. Treatment should be prioritized to patients in urgent needs and aerosol-generating procedures should be minimized.

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1. Introduction

1.1. COVID-19 event background

Coronavirus Disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). SARS-CoV-2 is the seventh discovered strain of the coronaviridae family. The COVID-19 epidemics was firstly reported in December 2019 in Wuhan, China when there was a cluster of patients presented with atypical pneumonia. The virus has gone on rapidly in the world. The World Health Organization (WHO) declared COVID-19 a public health emergency of international concern (PHEIC) on January 30, 2020 and characterised the outbreak as a global pandemic on March 11, 2020 [1]. By October 24, 2020, SARS-CoV-2 had infected over 42 million people with more than 1.1 million deaths in over 200 countries since its emergence [2]. Mutation in SARS-CoV-2 that increases infectivity and COVID-19 reinfection in medically fit patient were reported [3,4]. This raised the concern that COVID-19 may continue to circulate among the populations and could become just another endemic virus in our communities.

1.2. Clinical manifestations of COVID-19

According to available studies to date, the mean incubation period of COVID-19 is around 5–6 days, with 99% of cases not exceeding 14 days following exposure [5,6]. Person potentially exposed to the virus, therefore, has to undergo medical observation and quarantine for at least 14 days. The virus binds to the host's angiotensin-converting enzyme 2 (ACE2) receptors, which are type 1 membrane protein expressed by epithelial cells commonly found in the lung, intestines, kidney and blood vessels. Lung cells are more vulnerable to COVID-19 attack because they have high amounts of ACE2 receptors [7].

The clinical signs and symptoms of COVID-19 have been categorized into asymptomatic, mild, severe, and critical [8]. The majority of patients with COVID-19 represent relatively mild cases. Patients could have a fever, dry cough, sore throat, shortness of breath, malaise and myalgia. Many patients also reported a loss of sense of taste or smell. Less common signs and symptoms, such as confusion, diarrhoea, vomit, conjunctivitis, headache, rash on the skin, or discolouration of fingers or toes, can also occur [9,10]. One-fourth to one-third of the COVID-19 patients could develop serious complications, such as acute respiratory distress syndrome, arrhythmia and shock. For severe and critical patients, they have apparent symptoms and require hospitalization at individual facilities earmarked for COVID-19 patients. Some of them may even need intensive care. Older people (over 65 years old) and people with underlying health conditions, especially illness related to the respiratory system, cancer, obesity, and weakened immune systems are at higher risk and poorer prognosis.

While the symptoms of the COVID-19 are the same in adults as they are in children, children tend to present as asymptomatic or with milder symptoms [11,12]. Children have milder manifestations as they have less ACE2 receptors for SARS-CoV-2 [13]. The most commonly reported symptoms in children include fever, cough, rhinorrhoea, sore

throat, followed by vomit, diarrhoea, and abdominal pain. A small number of infected children developed an inflammatory response similar to the rare childhood illness Kawasaki disease [14]. Infants and children with underlying comorbid conditions may be at higher risk for severe complications [8]. Fatalities had been reported in children with COVID-19 but were extremely rare. Children represent a small fraction of the confirmed COVID-19 cases. Only 1–5% of the reported infections in China, Italy and the United States have been in people below 18 years old [7,15,16].

1.3. COVID-19 transmission

COVID-19 is transmitted via droplets, aerosol, direct or close physical contact. SARS-CoV-2 is most abundant in the nasopharyngeal region and the salivary secretions in infected individuals. When an infected person coughs, sneezes or talks, these droplets can infect others by direct contact, or forming the aerosol [17]. Some COVID-19 patients may exist as asymptomatic carriers or just with mild symptoms, but they can still act as vectors inadvertently spreading the virus to others in the community. Children who usually have no or milder infections can act as vectors to spread COVID-19 unknowingly. Infection can also occur by touching an infected surface and directly contacting eyes, nose or mouth, on which it can persist for a few hours to a few days naturally [18,19]. The virus has a long incubation period and can be detected on the surfaces from hours to days depends on the surface nature [19].

1.4. Dental settings and COVID-19

Dental practitioners, like all other healthcare professionals around the world, have been facing challenges of providing care to patients since the outbreak of COVID-19. The special working conditions of dental practitioners including proximity to patients, frequent handling of body fluids and the use of aerosol-generating instruments make dental clinics a potential area for COVID-19 transmission.

Most dental procedures involve the use of high- or low-speed handpieces, surgical handpieces, 3-in-1 spray (air/water syringes), ultrasonic scalers, air polishing devices, and lasers. These aerosol-generating procedures (AGPs) (employing air, water and cutting abrasives) produce high amounts of aerosol and splatter droplets from the patient's body fluids including respiratory secretions, saliva and blood. Aerosols can be suspended in the air for at least 30 min after the dental procedure and can be inhaled by people around despite a piece of near-by dental vacuum equipment is used. Pathogens of airborne diseases such as pneumonic plague, measles, tuberculosis, and influenza can be carried and transmitted by aerosols [20]. A study discovered that SARS-CoV-2 can remain viable in aerosols for up to 3 h after it is being aerosolized and land on surfaces for up to 72 h [19]. Thus, it is believed that COVID-19 can persist in the air and be transmitted through the airborne route as well.

SARS-CoV-2 presents in saliva, upper respiratory and nasal specimens of symptomatic or asymptomatic infected patients. Dental AGPs can aerosolize saliva and leads to airborne contamination with pathogens. The generated aerosols and

splatter droplets can then disperse rapidly within the clinical settings. The contaminated aerosols with SARS-CoV-2 could stay on the surfaces such as dental chairs, dental light, the spittoon, and dental instruments for a few hours, or even up to a few days [19], in particular when there are no proper disinfection measures. The use of high volume suction equipment and the negative-pressure room becomes important to eliminate contaminated air whilst controlling the direction of airflow.

Dental professionals are at an increased risk of COVID-19 cross-infection not just because of the aerosols generated from dental procedures. They work within intimate distances of patients (~50 cm from the patient's mouth) and are exposed to nine times more droplets and aerosols compared to the usual social distance of 1.5 m. The potential spread of the infection from the dental office to the community can also happen when there is a mishandling of patient/staff infected material like contaminated waste or dental impressions [21].

To minimise the risk of COVID-19 infections, only patients with a dental emergency were treated during the first few months of the pandemic in many parts of the world. Elective and immediate dental treatment are only recently resumed in countries where COVID-19 is constrained.

1.5. Paediatric dental healthcare and COVID-19

COVID-19 outbreak presents unprecedented challenges to the paediatric dentists. It is difficult to ascertain the infectious status of children. Infected children are mainly asymptomatic or with mild manifestations of COVID-19 and they could act as vectors in community transmission of the disease [22–24]. Moreover, uncooperative children may cry or scream during treatment. This could generate more natural aerosols when compare to treatment in adults. Dental treatment under sedation or general anaesthesia in operating theatre during the pandemic is also significantly reduced to relieve the burden to the health system [25].

Under COVID-19, ensuring safety in dental practices and protecting the health of practitioners, patients and the public is of paramount importance. All dental healthcare personnel must stay updated about the COVID-19 pandemic. Strict and effective infection control measures should be exercised at all times in addition to the standard universal precautions to minimise the risk of SARS-CoV-2 exposure and cross-infection in dental practices. Practitioners should have sufficient personal protective equipment (PPE) stocked to protect themselves and patients. Several changes in the layout of their dental practices and processes of care are required to align with the measure of physical distancing. This paper reviewed and summarised the guidelines and protocols available on the provision of dental care to paediatric patients in combating COVID-19 or any infection outbreak.

2. Recommended measures related to paediatric dental healthcare during COVID-19

Guidance in the provision of dental care during COVID-19 or any infection outbreak should cover administrative measures, infection prevention education and training, dental

healthcare personnel safety, programme evaluation, hand hygiene, personal protective equipment (PPE), respiratory hygiene/cough etiquette, sharps safety, safe injection practice, sterilization and disinfection of patient-care items and devices, environmental infection prevention and control, and dental unit water quality. Based on the available information and scientific evidence on COVID-19, World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), American Association of Paediatric Dentists (AAPD), Australian Dental Association (ADA) and some other authorities have made recommendations and guidelines to the provision of dental care during the infection outbreak [26–28].

2.1. Recommendations on personal protective measures against COVID-19

Personal protective measures should be undertaken to reduce the risk of being infected or spreading COVID-19 [29–32]. Not only healthcare personnel, but the general public should also follow.

- Clean hands with an alcohol-based hand rub or wash them with soap and water regularly and thoroughly.
- Wear a face mask (3-ply) for any activities in public.
- Maintain good respiratory hygiene, e.g. wearing a mask, covering mouth with an elbow when sneeze.
- Avoid touching your face, especially the eyes, nose and mouth, or a mask with unwashed hands.
- Maintain a social distance of at least 1–2 m (3–6 feet) between you and the others. This help to protect yourself from contacting the small COVID-19-containing droplets spread by infected people when they cough, sneeze or talk.
- Avoid going to crowded areas. It would be difficult to maintain a physical distance of 1–2 m (3–6 feet) with people.
- Stay at home and self-isolate when you are feeling unwell and with any signs/symptoms such as cough, headache, and fever.
- Seek medical care as soon as possible and follow the directions of your local health authority when you have a high fever, cough, sore throat, breathing difficulty or any flu-like symptoms.
- Keep informed about the pandemic from trusted sources, such as WHO, CDC or your local and national health authorities.

2.2. Guidelines for managing patients in dental practices during COVID-19

Under the infection outbreak, special arrangements should be made when providing oral health care services in dental practices [28,33].

2.2.1. Primary screening and triage

Dental team members have to communicate with patients or their parents before making appointments. Patients and their accompanying persons should be evaluated for their risk of contracting COVID-19 on phone and at the time when they visit. Information about their physical health (signs/

symptoms of COVID-19), travel history in the last month, contact history with confirmed or suspected patients with COVID-19 should be asked. The declaration form for the screening should be signed by parents/accompanying person as a legal record (Fig. 1).

Patients can be identified as low or high risk of having COVID-19 after the screening. Arrangements can then be made accordingly (Fig. 2). For high-risk patients, they should be triaged by the dental practitioner for their dental needs before making further arrangements. Non-urgent dental care should be deferred until the end of any mandatory quarantine period, or when the infectious risk is lowered. If urgent dental treatment is deemed to be necessary, extra infection control measures will be needed. The safety of the dental team and

other patients in the practice should always be taken into consideration. Patients with high risk should be isolated from other patients with low risk when they are in the dental practice. Ideally, negative-pressure room management should be arranged and only non-aerosol generating procedures (non-AGPs) should be performed.

2.2.2. Safety measures in the waiting area

All visitors to the clinic should measure their body temperature. They should also be advised to clean their hands with alcohol-based disinfectant and to wear a mask when they are in the dental clinic [28,29,31].

The waiting area for low risk and high-risk patients should be separated. Chairs in the waiting area should be placed at a

Declaration/Screening Form for COVID-19 Infection

Patient Name: _____ Age: _____
 Sex: Male Female
 Telephone: _____ E-mail ID: _____
 Home Address: _____
Record Body/Head Temperature: _____

COVID-19 Screening		YES	NO
1	Do you have any symptoms?		
	Fever		
	Cough fatigue, or myalgia?		
	Chills or Tremors		
	Sore throat		
	Diarrhea		
	Malaise		
	Myalgia		
	Shortness of breath or Difficulty in breath		
	Other, please specify: _____		
2	Have you travelled outside the country/region in last one month?		
	If YES, please specify the country/region and date: _____		
3	Have you visited a health care facility in the last on month?		
	If YES, please specify the location and date: _____		
4	Exposure to a confirmed COVID-19 case or suspicious patient in the last one month?		
	If YES, please specify the location and date: _____		
<input type="checkbox"/> High risk (At least one of the choices is YES)			
<input type="checkbox"/> Low risk (All the choices are NO)			

Declaration: *I hereby declare that all information provided above is true and accurate.

*I understand that withholding any information is unethical and against the interests of the global population fighting this pandemic.

*The above data collection is only for the purpose of ensuring the health and safety of the Hospital occupants amidst the outbreak of the disease. The data may be sent to the relevant health departments/ agencies for appropriate follow-up actions. Access to the data is restricted to the Hospital Administration and the aforesaid authorised parties.

Patient Signature: _____ Staff Signature: _____ Date: _____

Fig. 1 – Sample screening form for COVID-19 infection.

distance of 2 m (6 feet) to reduce the risk of spreading COVID-19. To reduce crowding in the clinic, patients should be accompanied by no more than one person.

Standard operating infection control measures including hand and respiratory hygiene, use of appropriate personal protective equipment (PPE), injection safety, instruments sterilization, waste management, and environmental cleaning should be taken in the dental practice to reduce the risk of cross-infection. Potentially containable objects such as chairs in the waiting area, doorknobs and handles should be disinfected frequently.

2.2.3. Safety measures for dental treatment

2.2.3.1. Pre-procedural mouth rinse. Pre-procedural mouth rinse for at least 30 s is recommended to reduce viral load in the oral environment to reduce risk of transmission [34]. It should now be a routine practice before any dental treatment. Oxidising agent disinfectants in mouth wash can destroy the lipid bilayer in the coronavirus envelope. Children should have pre-treatment mouth rinse under dentist supervision, or at least have their oral cavity cleaned with gauze soaked with appropriate agents (for children who could not spit). Chlorhexidine 0.12–0.2% has been recommended. Chlorhexidine has long been used by the dental team to reduce the intra-oral bacterial load of aerosol produced. However, its virucidal property is low and its efficacy in preventing the spread of SARS-CoV-2 virus was questioned [18,35]. Povidone-iodine 1% may be a better agent. It can reduce the SARS-CoV-2 viral load effectively [34]. The solution can inactivate SARS-CoV-2 even at a low concentration of 0.5% for 15 s. However, it may not be suitable for people with iodine hypersensitivity, thyroid disease, impaired renal function, pregnant and breastfeeding women. Hydrogen peroxide at 0.5–1% and sodium hypochlorite at 0.21–0.25% have also been recommended and shown to be effective against SARS-CoV-2 virus [18,35].

2.2.3.2. Aerosol-generating procedures. The virulent and highly contagious nature of COVID-19 is evident. The virus can be transmitted through the airborne route. It has also been shown to persist in aerosols for hours. Although SARS-CoV-2 transmission during dental practice have not been reported, all dental aerosol-generating procedures (AGPs) that employ air, water and cutting abrasives are at high risk of spreading the infection [36]. Therefore, in order to minimise risk of transmission, non-AGPs should always be considered whenever possible. If AGPs have to be performed, extra precautions should be taken to prevent cross-infection [37]. A strictly-set protocol with proper settings and personal protective equipment have to be followed.

- The patient should be arranged to have treatment in a single room with good ventilation (natural ventilation with airflow of at least 160 L/s per patient) or in a negative-pressure room with at least 12 air changes per hour.
- All dental personnel should wear proper personal protective equipment with surgical mask (at level 2 or 3; N95 respirator can be used for questionable cases if available), eye protection (goggles) or facial protection (face shield), disposable single-use long-sleeved fluid-resistant gown, and gloves.

- Staff should refrain from touching eyes, nose, or mouth with potentially contaminated gloved or bare hands.
- Rubber dam and high-volume suction should be used during treatment. External suction should be considered.
- Routinely clean and disinfect all exposed surfaces after each patient.
- Treatment room should be cleared of all paper and non-wipeable equipment. Glove and mask boxes and patient files should be stored outside the treatment room or in drawers.
- Limit the number of patients and accompanying persons in the treatment room.
- Avoid opening drawers or cupboards during procedures.
- Arrange extra personnel to be runners to assist the operator and assistants, and reduce the need to leave the room during procedures.
- A fallow period of at least 30 min is required post-AGP treatment to allow clearance of infectious aerosols.

2.2.3.3. Post-treatment cleaning. Upon completion of dental treatment, dental personnel should perform cleaning thoroughly.

- Careful doffing and disposal of all PPE and change to a new one.
- Perform hand hygiene again immediately after removing all PPE.
- All clinic surfaces in the dental settings/surgery should be thoroughly disinfected using chemicals recommended for eliminating SARS-CoV-2 (e.g. 75% alcohol, 1:49 diluted 5.25% sodium hypochlorite). For surfaces contaminated with blood or body fluid spills, 1:4 diluted 5.25% sodium hypochlorite solution should be used.
- Appropriate biomedical waste management and disposal protocol recommended by the local authorities need to be meticulously followed.

2.2.4. Follow up measures

Patients should be reminded to contact the dental clinic in case he/she or his/her accompanying persons are infected with COVID-19 within 14 days after the dental treatment.

2.3. Paediatric dental management approaches during an infection outbreak

The dental practitioner should communicate with patients or their parents before the dental visit to understand the oral health problems of the patients and perform triage [38,39]. Based on the chief complains of the patient, the dental treatment needs can be categorized into elective care, immediate care or emergency (Table 1).

Traditional dental treatment for carious primary teeth involves complete caries removal which requires the use of high-speed handpiece. This AGP is high risk and should be minimized to maintain a healthy environment in the dental clinic for the patients and dental staff during the pandemic. Low-risk dental treatment with less amount of aerosols generated should be performed whenever possible (Table 1). Hand instruments are preferred when compared to AGPs.

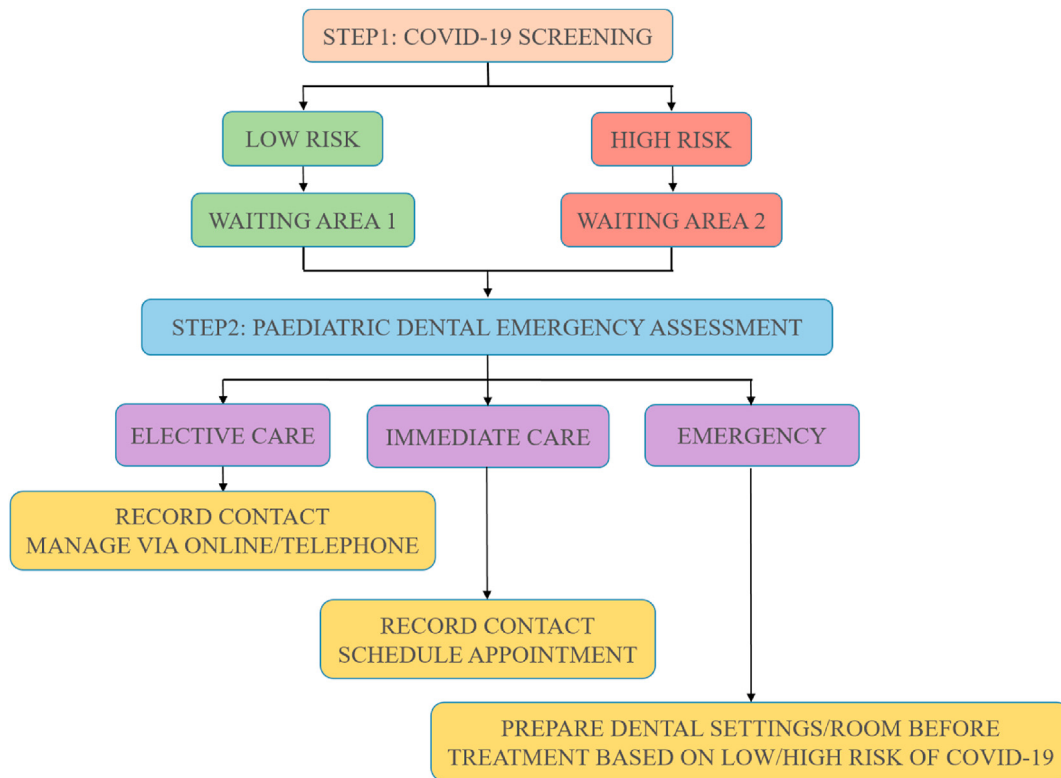


Fig. 2 – The screening and triage workflow for dental appointments.

Minimally intervention techniques that minimise or eliminate aerosol generation while controlling the progression of dental caries have advantages during COVID-19 era. Atraumatic restorative technique (ART) and Hall crown technique are alternative approaches for managing dental caries during the pandemic. ART involves preventive and restorative measures with good success rates. Hall crown technique can restore primary molars with preformed stainless-steel crown without the need of local anaesthesia, tooth preparation or any caries removal.

2.3.1. Elective care

Tele-dentistry can reduce face-to-face contact and help minimise risk during the peak period of community transmission. Some of the oral health problems and follow-up care, for example, monitoring of dental development monitoring, oral hygiene instructions, dietary advice, can be managed through teleconsultation, or telephone calls. Video technology can be used to conduct an extraoral and limited intraoral examination for these patients. Paediatric dentists can address the conditions and provide the necessary advice and care through tele-dentistry.

2.3.2. Immediate care

These patients have a dental treatment need but not at an emergency. Appointments should be scheduled for these patients. Treatment can be provided according to the established guidelines. Instruments/settings required for the visit should be carefully planned. Hand instruments should be considered to avoid generating droplets or aerosols. When the treatment involves AGPs, protocol on AGPs should be strictly followed.

2.3.3. Emergency care

In situations where emergency care is required, irrespective of the risk of COVID-19, patients should be seen immediately and dental treatment should be carried out as soon as possible. Dental conditions that require emergency care include:

- Uncontrol bleeding: Immediate hemostasis measures should be taken to reduce and stop bleeding.
- Acute pulpitis: Extreme and sharp pain which may last all the time may occur. Immediate pulp therapy should be taken to relieve the pain.
- Dental trauma/fracture (primary dentition): Severe tooth displacement may affect the unerupted permanent tooth germs. This should be dealt with immediately.
- Permanent teeth trauma/fracture: If a permanent tooth is hit to out of the oral cavity (avulsion), it must be replanted back into bone as soon as possible. If a permanent tooth is fractured with pulpal exposure, immediate treatment such as apexification or direct pulp capping should be done to improve the prognosis.

2.4. Preventive dental care

Preventive dental treatment should be emphasized during and post-COVID-19 era. Three levels of preventive care should be practised to prevent oral diseases and improve children oral health [40,41].

Primary preventive care is provided at the individual level. Preventive measures including dietary advice on reducing sugary intake and snacking frequency, proper toothbrushing

Table 1 – Low risk and high risk paediatric dental interventions.

Category Level	Paediatric dental conditions	Oral signs and symptoms	Interventions	Low risk and high risk procedures based on the amount of aerosol generation	
				Low risk	High risk
Elective care	Tooth eruption consultation	Transient pain	Manage by some advice through online internet, telephone call or message	✓	
	Children oral healthcare consultation	Severe dental anxiety Bad smell Cumulative plaque Pigments			
Immediate Care	Oral mucosa disease/trauma	Transient pain			
	Dental caries prevention	White spot	Fluoride varnish Hall crown Pit and fissure sealing Hall crow	✓ ✓	✓
Emergency	Dental caries (Early childhood caries/Young permanent teeth caries)	Tooth colour turns into yellow/brown/black Pain Tooth decay Root apical is open	Diagnostic photographs (X-ray) Silver diamine fluoride Preformed metal crown Filling Indirect/Direct pulp capping Pulpotomy Apexification	✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓
	Chronic pulpitis	Pain Swelling	Diagnostic photographs (X-ray) Root canal therapy Tooth extraction	✓	✓ ✓ ✓
Emergency	Necrosis of pulp	Pain Swelling	Diagnostic photographs (X-ray) Root canal therapy Tooth extraction	✓	✓ ✓ ✓
	Gingivitis/periodontal diseases	Plaque Gingival swelling Dental calculus Bleeding Loosen teeth	Hand scaling Ultrasonic scaling Surgery	✓	✓ ✓ ✓
Emergency	Lingual/labium frenum	Lingual/labium frenum is too short or too long to impact the oral function	Observation Surgery	✓	✓
	Tooth Cyst/Odontoma	Dento-alveolar pathology	CBCT, MRI, CT Surgery	✓	✓
Emergency	Congenital or acquired malformation of the jaw/face/teeth	Craniofacial malformations such as CLP	CBCT, MRI, CT Early orthodontic care Surgery	✓	✓ ✓ ✓
	Bleeding gum without stop	Bleeding Pain	Haemostasis		✓
Emergency	Acute pulpitis	Night pain Sharp and persistent pain	Diagnostic photographs (X-ray) Root canal therapy	✓	✓
	Primary dental trauma/fracture	Tooth fracture with or without involving the pulp	Observation Diagnostic photographs (X-ray) CBCT, MRI, CT Filling Indirect/Direct pulp capping Tooth extraction	✓ ✓ ✓	✓ ✓ ✓ ✓ ✓
Emergency	Young permanent teeth trauma/fracture	Tooth fracture with or without involving the pulp	Observation Diagnostic photographs (X-ray) CBCT, MRI, CT Pulpotomy Apexification Orthodontic support Splinting of traumatised teeth Tooth replantation	✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓

habit and the use of fluoridated toothpaste should be introduced to every patient. Individual oral health promotion helps to lower the caries risk and prevent oral diseases from developing.

Secondary preventive dental care aims to identify oral health problems at an early stage and provide necessary preventive care. Early disease detection is important and the subsequent preventive interventions help to stop the

problems from progressing. For example, children examined to have white spot lesions (incipient stage of dental caries) would need to have topical fluoride application and reinforcement of proper toothbrushing and dietary habit so to prevent the lesions from progressing. Other examples of secondary preventive treatment include the application of fissure sealants on pits and fissures, and resin infiltration for incipient interproximal carious lesions. Both interventions are for incipient non-cavitated carious lesions, delaying or preventing the need for AGPs for the patient.

Tertiary prevention focuses on people who are already affected by a disease. The target of tertiary prevention is to treat oral diseases as early as possible so to prevent possible complications, and to reduce the negative impact of the diseases on oral function and quality of life. This is usually done by treating the disease and providing rehabilitation, for example, application of silver diamine fluoride, scaling, restorations, and pulp treatment.

2.5. Special oral healthcare for children with special needs

For children with special needs, such as intellectual disability, cerebral palsy, physical disability, visual impairment, hearing impairment, or children with other systemic diseases, oral health care can be challenging, in particular during the COVID-19 pandemic. They are at a higher risk of oral health problems [42]. Prevention is always better than cure. Preventive treatment at three levels should be provided for children with special needs. Development of oral health problems can be prevented and the consequence dental treatment needs can be lowered. Preventive treatment and behaviour management approaches for children with special care needs are listed in Table 2.

3. Resumption of paediatric dental practice

The level of COVID-19 transmission rate in every country is different. The regulations and policy response to the pandemic are specific to the level of transmission in the area. World Health Organization has been kept updating the new cases all over the world once a week [43]. The level of COVID-19 transmission could be categorized into low-risk area (<100

new cases in past seven days), moderate-risk area (~100–1000 new cases in past seven days), and high-risk area (>10,00 new cases in past seven days).

In a high-risk area, enforcement of social distancing or lockdown would be imposed to slow down the rate of infection. As per advised by guidelines issued by many health authorities, aerosol-generating procedures should be reserved for urgent and emergency treatments in the high tide of the pandemic. Elective dental visits should be deferred. In the moderate-risk area, dental clinics or hospitals can reduce restrictions to some extent while maintaining all the preventive precautions. Dentists are advised to follow the established guidelines for patient management. Before visiting a clinic, the parents should help their children to self-evaluate their oral conditions. Online oral health advice or teleconsultation can be offered before a dental visit. Parents and children should wear protective masks in dental clinics or hospitals, while strictly practising social distancing. Minimally interventional approach, atraumatic restorative treatment (ART), and other non-AGP procedures such as silver diamine fluoride application, selective caries removal, and Hall crown should be employed. For low-risk area, routine dental procedures can be performed in dental practices. Protective measures and precautions should be strictly followed. Dental clinics or hospitals should follow the guidelines developed by their local authorities.

4. Practising dentistry with COVID-19 vaccines

Several COVID-19 vaccines are developed and being rolled out at record pace [44]. Interim analysis of data from the phase III clinical trial of the vaccines showed that they can prevent people from getting COVID-19 and reducing the severity of symptoms. The vaccines effectiveness were ranged from 70% to 95%. This is a significant news and may offer an opportunity to put the pandemic behind us. However, there is still a need for long-term follow-up to evaluate the final efficacy of the vaccines, the duration of protection and the possible complications of vaccination. COVID-19 vaccines can protect the population from getting sick, but cannot eliminate the virus or stop the transmission [44,45]. It also takes time for the vaccines to reach out the entire population across the world (at

Table 2 – Oral health care for children with special care needs.

Conditions required special care	Preventive management	Special behaviour management
Intellectual impairment (e.g. Down's syndrome)	1. Pre-education and care to help/encourage to go to the dentist	• Help children to familiar with the dental circumstance
Cerebral palsy	2. X-ray is necessary	• Speak slowly, repeat and listen
Physically disabled	3. Oral healthcare preventive measures are necessary including home oral healthcare, food and nutrition, fluoride application, pit and fissure sealing, and regular dental visit	• Give order one step by one step
Visual impairment	4. Protection and fixation measures	• Reduce treatment duration
Hearing impairment	5. Parental guidance	• Mouth prop application
Children with other systemic diseases		• Sedation and analgesia measures
		• Special support for physical access
		• The tell-show-feel-do method (TSFD)
		• The tell-show-feel-do method (TSFD)
		• Prepare special needs or requirements

least 60–70% population had to be vaccinated to reach herd immunity). Wearing a mask, maintaining sensible social distance and keeping good hand hygiene are still essential in our daily life for a period of time. Special precautions discussed still have to be implemented in dental clinic to prevent transmission among patients and staff for the moment.

5. Conclusions

SARS-CoV-2 mutates continuously and is becoming more transmissible. Renowned infectious diseases experts have expected that COVID-19 could like seasonal flu and persist among us in the communities. Researchers are still exploring the most effective treatment to control COVID-19. Sophisticated COVID-19 vaccines are developed, but with a need for long-term follow-up to establish the efficacy, protection duration and possible complications. For the moment, we should not drop our guard against the COVID-19 pandemic. Diligent attention on transmission-based precautions is the primary approach to restrict the spread of the coronavirus. Provision of dental care and treatment will not be quite the same as what we were used to. Traditional approaches used to manage paediatric oral health problems before COVID-19 pandemic will need to be adapted to the new era. Minimally intervention techniques that minimise or eliminate aerosol generation, plus comprehensive oral health preventive measures should be practised to safeguard safety at dental practices in this unprecedented time to control the disease and maintain the oral health of the population.

Declaration of competing interest

The authors declare that they have no conflict of interests.

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