

The Use of Teledentistry in Pediatric Dental Practice Amidst COVID-19 Lockdown: A Literature Review

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Abstract

The recent spread of coronavirus disease (COVID-19) has caused widespread public health concerns. All the countries of the world are taking necessary measures to prevent the community spread of this disease. In doing so, many countries have imposed lockdowns to restrict the movements of its citizens within the country. Realizing the severity of outcomes associated with this disease, dentists who were estimated to be at high risk of acquiring the disease rendered only emergency treatments to their patients. However, due to nationwide lockdown, it was difficult for the patients to visit the clinics for routine check-ups. This was overcome by the recent advancements in the field of technology. Today, in the age of smartphones, clinical data exchange was facilitated with the help of mobile cameras and video conferencing applications. These types of virtual consultations formed the basis of teledentistry. Teledentistry is a combination of telecommunications and dentistry, involving the exchange of clinical information and images for dental consultation and treatment planning. This technology served as a boon for the pediatric dentists to manage dental health concerns of children during the lockdown period. This review discusses about teledentistry and its applications in pediatric dental practice among the COVID-19 lockdown.

Keywords: COVID-19, lockdown, pediatric dentistry, teledentistry

INTRODUCTION

Coronavirus belongs to a family of viruses (*Coronaviridae*), which usually are zoonotic in nature and transmitted between the animals and humans.^[1] This outbreak of coronavirus disease 19 (COVID-19) was first reported in Wuhan city in China, in December 2019.^[2] As of today, this has now become a global issue affecting 104 countries and territories worldwide.^[3] The infection spreads from people who have been in close contact (within 6 feet distance). This could occur due to exposure to the respiratory droplets from the infected individuals during coughing or sneezing.^[4] In order to curtail the spread of the virus, the governments of various countries have enforced a lockdown wherein the movement of citizens out of the countries is restricted. According to Occupational Safety and Health Administration, dental health-care professionals are placed in very high exposure risk category as dentists work in close proximity to the patient's oral cavity.^[5] During the COVID-19 period, an adequate management of the

oral health of children is of crucial importance. This could be done by implementing the specific protocols relating both to the pathologies which come under emergency and non-emergency situations. In both these instances, "teledentistry" proves to be an aid for pediatric dentists. It involves the usage of recent advancements in telecommunications to perform virtual dental checkups for children. It helps the pediatric dentist manage the emergencies by teleconsultation, thereby postponing the dental visit until the lockdown is lifted. The following review aims to elicit the importance of teledentistry to manage pediatric dental patients during the times of COVID-19 lockdown.

WHAT IS TELEDENTISTRY?

The term "Teledentistry" was first used in 1997, when Cook defined it as "the practice of using video-conferencing

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technologies to diagnose and provide advice about treatment over a distance.”^[6] It was first used by NASA in 1970s and then by the US military as a part of the U. S. army’s total dental access project which begun in 1994. It was the frontier of teledentistry which enabled the dentists from US armed forces to have a specialist consultation at a medical center regarding their patients.^[7] Teledentistry has two modes:

Real time consultation

Real-time consultation involves a video-conference in which dental professionals and their patients, at different locations, may see, hear, and communicate with one another using advanced telecommunication devices using high-speed Internet connections.^[8,9]

Store and forwards

Store and forward, on the other hand, involves the exchange of clinical information and static images collected and stored in the telecommunication equipment. The dental practitioner collects all required clinical and radiographic information from the patient. This information is then sent to the specialist for consultation and treatment planning. The treatment is thus provided in a far more timely, targeted, and cost-effective manner.^[9]

Pediatric dentistry being an age-specific practice, store and forward is used for specialized consultations with pediatric dentists regarding complex problems. During this, the dentist shares stored clinical photographs and radiographs with the pediatric dentist and formulates a suitable treatment plan. This treatment plan is then conveyed to the parents.

RISK FACTORS FOR COVID-19 IN PEDIATRIC DENTAL PRACTICE

Children are asymptomatic or show mild symptoms when affected by COVID-19 which has raised concerns for its hidden role in the transmission. Children talk loudly and express themselves without restraints. Documentation suggests that talking loudly and shouting may cause the spread of the infection through droplets. Similarly, touching the face, nose, and mouth is common during play among children.^[10] These age-specific concerns might suggest their role in transmission. Within a dental office, the virus can be transmitted between the dentist, dental assistant and child patient through droplets generated by coughing and sneezing or by any of the dental procedure. The use of high-speed turbine, ultrasonic scaler, and three-way syringe are all aerosol-producing instruments. These aerosols may tend to remain in the environment and cause cross infection to other patients. The use of removable orthodontic appliances or auxiliary elements in fixed orthodontics such as intermaxillary elastic bands, possesses risks of contamination if not handled cautiously. The presence of caregivers in the operatory accompanying the patient can also lead to increase in the chances of infection.

ROLE OF TELEDENTISTRY IN PEDIATRIC DENTAL PRACTICE

Management of pediatric dental emergencies

The most common pediatric dental emergencies include dental pain, dentoalveolar abscess, and dental trauma. These conditions require immediate intervention as the treatment for these cannot be delayed. However, during the times of the COVID-19 lockdown, certain modifications in the initial treatment were essential. A summary of the treatment plan of these emergencies is shown in Figure 1.

Dental pain

Endodontic infections can cause severe pain^[11] and are considered to be an important category of dental emergencies.^[12] The dentist should ask patient’s parent about the nature of pain and evaluate the condition on the basis of patient’s history. The first line of management of patients with dental pain is the prescription of suitable antibiotics. After prescribing a suitable antibiotic course, the dentist keeps a proper follow-up of the patient. If the pain subsides, the treatment of the patient can be delayed till the lockdown is lifted. If the pain still does not subside, then the dentist can call the patient to the clinic for the emergency treatment. This decision, however, should be made by dentist based on the severity of the situation and his clinical acumen.

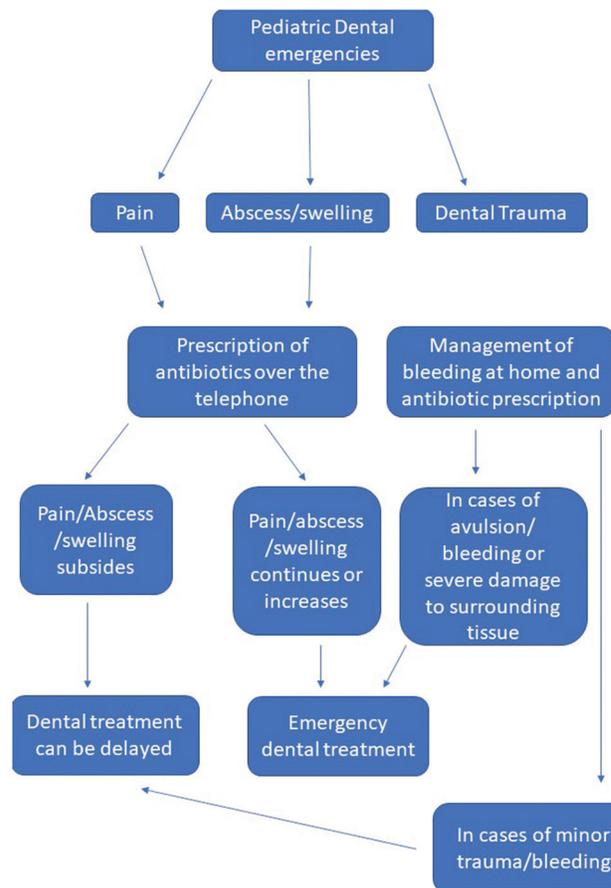


Figure 1: Summary on the management of pediatric dental emergencies.

Dental abscess or swelling

The chronic cases of pain or dental infections sometimes exacerbate as an abscess or swelling. In this condition, the dentist can ask the parents to send an extra-oral and intra-oral photograph of the child. This helps the dentist to evaluate the extent of the swelling in a much better way. If the swelling is intraoral and not extensive, a routine antibiotic course can be given to the patient. This usually is sufficient for reduction in size of the swelling and intervention can be delayed. If the swelling is extra-oral and extensive, then an emergency dental appointment needs to be scheduled.

Dental trauma

During the times of the lockdown, majority of the children tend to play at home. This can stimulate the need for more lively modes of play in children and cause an increased risk of dental traumatic injuries. In case of an episode of dental trauma with minimal bleeding and inflammation, the application of pressure to the bleeding site and suitable anti-inflammatory drugs can be prescribed. However, in severe cases such as avulsion, complicated crown and root fracture or trauma to the surrounding tissues, emergency intervention is required.

Management of emergency dental problems in clinic

The American Dental Association has highlighted the key steps to be performed by dental professionals along with standard universal precautions. It included recording patients recent travel history; assessing signs and symptoms of respiratory tract infection; recording body temperature; mouth rinsing with 1% hydrogen peroxide before commencement of any procedure; utilization of rubber dam and high-volume suction during procedures and frequently cleaning and disinfecting public contact areas.^[13] During the outbreak of COVID-19, hand hygiene has been emphasized repeatedly in case of dental practitioners. The use of a particulate respirator such as the N-95 mask has been recommended for treating patients. Otherwise, at least a surgical mask must be used while treating all patients when the distance between the dental health-care worker and the patient is <1 m.^[14]

Management of dental problems which do not represent an emergency

During the times of COVID-19 lockdown, only emergency dental treatment was being carried out. Hence, the parents must be made aware of conditions which serve as an emergency and those which can be managed only with palliative measures. The treatment of nonemergency cases can be delayed till the lockdown is lifted.

Several clinical scenarios wherein the treatment can be managed by the parents at home are:^[15]

1. Ongoing dental treatments with a dislodged temporary restoration can be maintained by keeping the cavity free of debris by mechanical brushing postevery meal. It is also recommended to avoid hot or cold foodstuff till the time a temporary filling is replaced on the cavity
2. If the tooth in question is endodontically treated, then the cavity is washed with a dilute solution of hydrogen

peroxide using a syringe without the needle. During the child's meals, a cotton pellet is placed in the cavity by the parents to avoid food impaction

3. Delays with deciduous tooth exfoliation in conjunction with permanent tooth eruption are quite common occurrences. In such cases, the parents are advised to give the child raw fruits and vegetables which stimulate the loss of deciduous tooth from the alveolar support
4. Eruptive gingivitis is a commonly seen condition with the first permanent molar. The parents are advised to clean the area with swabs to prevent food debris and anti-inflammatory mouthwashes are also prescribed.

Applications in preventive dentistry

The main aspect of preventive dentistry includes regular check-ups which are planned by a pediatric dentist. This helps to evaluate any dental problem before it becomes symptomatic. In times of this pandemic, these regular visits are difficult since that puts the child and parent at risk of cross infection in a dental setup. In order to overcome this, the pediatric dentist can use digital platforms to evaluate the oral health of children and also educate the parents for timely preventive care. This could be achieved by teleconsultations with the help of pictures or video calls. Parental education can be achieved by making video on home care measures which can be implemented by parents easily. The aim of doing this is to minimize the child's visit to dental office and also prevent the onset of caries during the lockdown.

Along with regular home care measures, the parents should also be counseled about intake of carbohydrates. During the lockdown period, the diet of children constitutes a high proportion of fermentable carbohydrates. This could prove deleterious to the oral hygiene of the child. Parents should be instructed to limit intake of carbohydrates and also given a brief picture about cariogenic and carioprotective nature of various foodstuffs.^[16] Children should be encouraged to have a diet rich in fruits and vegetables since they have less cariogenic potential. However, soft drinks and energy drinks should be avoided since they contain high quantities of sugar and acids which may cause dental erosion. Instead, the usage of natural and artificial remineralizing agents should be encouraged. The parents can be advised to use xylitol as a sugar substitute in the diet. Furthermore, intake of cheese can also be encouraged since the children enjoy having cheese along with its remineralizing potential as well. In case of noticeable white-spots lesions, remineralizing pastes containing casein phosphopeptide-amorphous calcium phosphate can be recommended to the patients with the usage of teledentistry.

Management of children undergoing orthodontic treatment

Recent studies reveal that there is the high expression of angiotensin-converting enzyme 2 receptor in the oral cavity, which is the main host cell receptor for SARS-CoV-2 virus.^[17] In case of removable orthodontic appliance, proper hand hygiene measures need to be followed by the parents. Even the appliance needs to be cautiously sanitized and stored in

an appropriate box after use. For fixed appliances such as rapid palatal expander, the activation of the screw has to be stopped till the lockdown is lifted. The parent needs to be instructed about avoidance of sticky caramelized food during the lockdown. Failing which, an immediate intervention would be triggered by pediatric dentist. In case of fixed multi-bracket therapy, if a single bracket debonds from the tooth, the parent can reposition the bracket manually, postponing the re-cementation till the lockdown is lifted.

Management of children undergoing preventive orthodontic treatment

Most of the preventive orthodontic treatment involves the placement of space maintainers. These are fixed appliances which are cemented on the teeth to prevent tooth movement and avoid space loss. During the COVID-19 lockdown, if the space maintainer gets dislodged, the patient can be asked to replace it with finger pressure back onto the teeth. In case of breakage of the appliances, the parents can be advised to store the space maintainer in an appropriate box till the lockdown is lifted.

Advantages of teledentistry in pediatric dental practice during the COVID-19 pandemic

Teledentistry served as a boon to pediatric dentists for patient management during the lockdown period. The management of preliminary emergencies was done efficiently with the help of teleconsultations. It helped to prevent the exposure of the child to a dental setting just for a check-up. Even specialist consultations were performed by sending the clinical pictures and scans which aided in prompt and efficient treatment plan. In case of ongoing treatments or where emergency treatments were performed, the follow-up was done using teledentistry.

Difficulties faced with teledentistry in pediatric dental practice during COVID-19 pandemic

In these testing times of COVID-19, teledentistry serves as a boon for dental professionals. It tends to solve the majority of the problems, although it still lacks the advantages of examinations performed clinically. In teledentistry, the dentist has to rely on the signs and symptoms informed by the patient and various crucial steps of diagnosis cannot be performed, palpation and percussion being the most important ones. In cases of emergency, the visit to a dental clinic becomes mandatory.

Parental Perception of teledentistry during COVID-19 lockdown

Teledentistry served as a valuable aid for parents to communicate with their child's dentist in cases of dental problems. Majority of the problems were solved virtually without going to the dental clinic. Routine follow-up appointments and minor dental issues could be resolved along with parental assistance. Furthermore, the parents could provide a better diet to their children to prevent caries due to regular contact with the dentist. Even in cases of emergencies, the appointments could be scheduled with the dentist on an emergency basis.

Studies related to teledentistry in pediatric dental practice

Kopycka-Kedzierawski and Billings showed that teledentistry is as good as visual/tactile examinations for dental caries screening in young children.^[18] Kopycka-Kedzierawski *et al.* suggested that teledentistry offers a potentially efficient means of screening high-risk preschool children for the signs of early childhood caries.^[19] Amavel *et al.* stated that the remote diagnosis of children dental problems based on noninvasive photographs constitute a valid resource.^[20] Kopycka-Kedzierawski *et al.* demonstrated that the intraoral camera is a feasible and potentially cost-effective alternative to a visual oral examination for caries screening, especially early childhood caries, in preschool children attending childcare centers.^[21]

Future research scope

Teledentistry aims to improve the overall oral health of the child utilizing virtual consultations. Not only in a pandemic, teledentistry can be used in regular day-to-day practice. New applications which assist in teleconsultations should be developed. It should facilitate examinations, sending of appropriate radiographs and also formulating a suitable treatment for the child virtually. It would provide easy consultation and give sufficient time to the dentist and avoid a crowded dental office.

CONCLUSION

Teledentistry has proved to be a boon for pediatric dentist to manage oral health concerns of children among the COVID-19 lockdown. By using teleconsultations, majority of the emergency situations such as severe pain, abscess, or minor dental traumatic injuries were managed by pediatric dentists. It also aided in parental education about palliative care and dietary modifications during the lockdown. The parents were also counseled about preventive treatments which could be practiced at home. It allowed the pediatric dentist to conduct virtual follow-up visits post any emergency procedure restricting the entry of the children in the dental clinic.

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Conflicts of interest

There are no conflicts of interest.

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