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RESEARCH ARTICLE

GENERAL CONSIDERATIONS AND ADAPTATION IN PEDIATRIC DENTAL SETUP DURING COVID-19 PANDEMIC

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Abstract

The emergence of the COVID-19 pandemic is a major global health challenge. As providers of dental health care, we have a significant responsibility towards our patients to reduce the exposure to the virus. This risk is even more severe in pediatric dentistry, as infected children also have asymptomatic, mild or moderate clinical viral infection and therefore play a vital role in community based COVID-19 transmission. As universal guidelines cannot be applied during the course of COVID-19 outbreak, routine dental procedures can be postponed and only emergency dental procedures must be treated. In the case of dental emergency involving a pediatric patient, dentist should be aware of the safety management protocols that can be followed during the dental practice to protect child patient, parent and themselves against viral transmission. In addition, emerging data on safety protocols is constantly changing as per the state and local health departments. Thus as a dental health professional it's our duty to be aware of the modifications needed to update our dental practice. In this review article, we have discussed the current guidelines and the modifications which can be adapted to the pediatric dental set up so as to limit the cross-contamination caused by the virus.

Introduction:-

Coronavirus disease (COVID-19) has spread rapidly across the world and has become a major health emergency in many countries around the globe.

The virus was first detected in Wuhan, China, following an outbreak of pneumonia of unknown cause in December 2019, with most early cases of exposure to live animal market. On 31st December 2019, China announced the outbreak to the World Health Organization (WHO). On 30th January 2020, WHO declared the latest outbreak of coronavirus as a public health emergency of international concern and then on March 11th 2020 it was declared as a global pandemic.[1] COVID-19 is known to be caused by severe acute respiratory syndrome coronavirus-2 (SARS-COV-2) virus.

According to WHO, on 20th June 2020, the number of confirmed cases was 8,525,042 and reported deaths were 4,56,973.[2] On 23rd January 2020, the first case of a dentist was diagnosed with COVID-19 at the Department of Preventive Dentistry in the Wuhan University Dental Hospital. Eventually, the transmission of disease to eight other oral healthcare professionals was reported.[3] Due to the nature of dental practice, a high amount of aerosols are

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generated, as well as there is a close proximity of dentists and patients during dental treatment. Dental professionals with allied dental staff are considered to be most susceptible to SARS- CoV-2 during patient management.

Adequate management of dental health of children during the COVID-19 pandemic period is of fundamental importance. This should be done by implementing specific protocols. In this situation, main the objective is to limit spread of the pandemic and onset of cross-infections. The characteristics of epidemiological spread and clinical manifestations of COVID-19 in children have not yet been fully clarified. This review article, highlights the modifications which can be adapted in pediatric dental setup so that transmission of SARS- CoV-2 while treating children can be avoided.

Peculiarities of COVID-19 infection in children.

At the moment, several international studies published that the majority of pediatric cases with COVID-19 showed decreased severity. There are different stages of COVID-19 infection based on clinical signs and symptoms: asymptomatic, mild, moderate, severe and critical.[4] Patients with COVID-19 show clinical manifestations similar to symptoms of SARS-CoV and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infections which include fever, non-productive dry cough, dyspnoea, fatigue, myalgia, normal or decreased leukocyte counts, and radiographic evidence of pneumonia. The incubation period of COVID-19 is 2-14 days.[5] Infected children tend to be asymptomatic, thus child patients and parents should be considered as potential carriers of SARS-COV-2 virus when they visit a dental setup.[6]

The reduced susceptibility of a child to COVID-19 infection can be related to their innate immunity. The IgM isotype plays a key role in understanding the protection mechanism in children. Secondly, children have the ability to rapidly generate natural antibodies with broad reactivity that have not yet been selected and shaped by reaction to common environmental pathogens.[7,8,9]

Spread of virus in a dental setup

Dental professionals come in direct contact with potentially high-risk situations. Most of the work performed in dental office involves aerosol generating procedures (AGPs) which may be responsible for transmission of acute respiratory infections.[10]

An experimental study revealed that SARS-CoV-2 remained viable in aerosols for approximate 3 hours. SARS-CoV-2 virus can persist on surfaces for up to 72 hours. The experts also found that SARS CoV-2 was detectable on copper for 4 hours, up to 24 hours on cardboard and for 2-3 days on plastic and stainless steel.[11] Therefore, droplet and aerosols spread from infective individuals and frequent contact of contaminated surfaces in dental settings are a potential source of SARS-CoV-2 transmission among dental professionals.[10] In a dental setup, dental chairs, their handles, the spittoon, dental instruments and many other surfaces are more likely to get contaminated after carrying out a dental treatment.[3] Hence, universal precautions should be routinely followed in dental clinics. A list of agents that are effective against SARS-CoV-2 for surface disinfection such as sodium hypochlorite, isopropyl alcohol have been provided by United States Environmental Protection Agency.Bottom of Form

Special Precautions for managing dental emergencies in COVID-19 outbreak

Virtual communication

Technologies are presently available to help dental professionals to perform initial screening of patients and identify emergencies at this time of pandemic. In dental emergencies, initial management can be commenced over telecommunication by advising analgesics and antibiotics to patients. However, in cases where initial palliative medication therapy doesn't show any improvement, urgent dental care can be provided.

Pre-appointment behavior modification using virtual communication can be introduced to a child where the changes in appearance of dental professionals and in the clinic setup can be shown for ease in his visit.

Evaluation of patients

A screening protocol has to be followed to determine the potential exposure to COVID-19 before scheduling an appointment. American Dental Association (ADA) along with other dental societies have proposed a list of probing questions which allows a dental professionals to understand the patients potential exposure to COVID-19. Firstly, patients should be asked if they are positive for COVID-19 or show signs of respiratory distress including cough, shortness of breath or sore throat. In addition, the patient should be questioned on their recent travel history or any

close contact with infected individuals.[13] These questions should be mandatory for all patients. If the patient says 'yes' to any of the mentioned questions and requires dental treatment, then American Center for Disease Control and Prevention (CDC) has recommended immediate patient referral to a facility equipped to manage potentially exposed or confirmed COVID-19 patients.[14] If the patient doesn't respond positively to the foregoing questions and requires dental treatment, then his appointment is to be scheduled. On visit to the dental clinic, body temperature should be recorded with contact-free forehead infrared thermometer. Patient should be given a surgical facemask. Hand hygiene steps should be followed. Emergency dental care should be provided with infection protocol policies strictly followed.

Waiting Area

Waiting areas in dental practices are common areas where there is likelihood of cross infection. It is important to regulate the number of people present in or around the waiting area. While scheduling pediatric patient's appointment, only one parent should be requested to accompany the child. In addition, pediatric setup has waiting area or play area arranged with soft toys, books, magazines to make it more child-friendly. In the current pandemic situation, removal of such non-essential items is necessary from the waiting room so that harboring of the virus particles on the respective surfaces can be prevented. CDC advises, limitation of people in the operatory area so that when AGPs are initiated, cross-infection can be prevented. But in some circumstances necessary preventive measures need to be undertaken while treating infants and children where presence of parents becomes essential in the operatory area.[12] The norm of 'Social Distancing' should be followed in the waiting area by ensuring that sitting spaces are 6 feet apart or give staggering appointments. The waiting area should have adequate ventilation. According to recent CDC guidelines, increased filtration efficiency to the highest level in the waiting and operatory area should be compatible with the Heating, Ventilation, Air Conditioning (HVAC).[12] Further safety measures include frequent cleansing of 'high-touch' surfaces such reception counter, toilet door, door knobs and handles using a neutral pH detergent.[15] In addition, patient related infographic images demonstrating common symptoms of COVID-19, optimum hand hygiene techniques, managing cough etiquette, concept of 'Social Distancing' which are easy to read and understand should be exhibited in the common areas in the waiting room.[16]

Hand Hygiene

According to CDC guidelines, dental professionals should perform hand hygiene before and after patient contact. It is recommended to install contact-free dispenser, which is either foot-controlled or with hand sensor to dispense soap or alcohol-based hand rub (ABHR). Hand hygiene should be performed by washing hands with soap and water for at least 20 seconds[12] or ABHR with 60-95% alcohol. However if hands are visibly soiled, soap and water should be used before returning to ABHR. After using ABHR, the dental professionals must dry his or her hands thoroughly before putting on gloves, because any residual alcohol may increase the risk of glove perforation. The CDC recommends the use of ABHR containing various emollients and other skin conditioners as a strategy to reduce skin damage, dryness, and irritation.[17,18]

As suggested by WHO (2009), hand hygiene should be performed before touching a patient, before any cleaning or aseptic procedure is performed, after exposure to body fluid, after touching a patient, after touching patient's surroundings, before wearing and after removing PPE, including gloves.[19]

In pediatric practice, a child patient may not follow the exact duration for hand sanitization. So as a reminder, music can be played for recommended 20 seconds[12] till child completes the process of hand hygiene.

Personal protection equipment (PPE)

Inhalation of virus containing aerosols is a major and potent cause of COVID-19 infection.[20] Hence, PPE must be worn, to provide an effective and efficient barrier against the aerosol generated hazards from the operative site. These include protective eyewear, a face mask and a face shield, a disposable working cap, appropriate gloves, gowns and impermeable shoe covers.[21]

1. Protective eyewear and face shields: It is clinically evident that COVID-19 may also be transmitted through contact with the mucous membranes in eyes, as infectious droplets could easily contaminate the human conjunctival epithelium.[22] To protect the eyes from aerosols and debris created during dental procedure, protective eyewear and face shield should be worn throughout the treatment.
2. Face masks: When performing AGPs (using high-speed handpiece, air-water syringe, and ultrasonic scaler), a particulate respirator that is at least as protective as a National Institute for Occupational Safety and Health (NIOSH)-certified N95, European Standard Filtering Face Piece 2 (EU FFP2), or equivalent can be used. When

performing emergency dental treatment with suspected COVID-19 cases, a higher level of respiratory protection should be considered, such as EU FFP3 respirators conforming to European Standard 149 (EN149).[23]

In pediatric dental practice, child's co-operation and management has always been challenging. This gets further difficult with the PPE attire. Some child friendly modifications like pleasant colored or printed gown, cartoon figures on frame of face shield, printed facemask can be used to develop a positive behavior during dental treatment.

There are certain adaptations that can be revised in the pediatric dental setup. These modifications are given in the following Table I[24].

Table I:- Modifications in a Pediatric dental setup (Adapted from American Academy of Pediatric Dentistry Guidelines)[24.]

Telecommunication	1. Medical and travel history of children and parents. 2. Advise only one parent to accompany the child/children for dental treatment. 3. Virtual communication - To modify child's behavior before dental visit.
Evaluation of patients	Assessment of body temperature of child/children and parent before beginning the dental appointment.
Waiting area/Play area	Removal of non-essential items (soft toys, story books, games). Social distancing should be maintained between patients by keeping a distance of 6 feet in sitting spaces.
Hand sanitization area	1. Post signs about hand sanitization etiquettes in a simple language. 2. Play song for 20 seconds as reminder therapy for children to implement hand sanitization.
PPE-Face Shield Modifications	Child friendly modifications

Radiographs

Intraoral radiographs might induce gag reflex, increased saliva secretion and coughing in patients. As recommended by American Association of Endodontics (AAE) use of intraoral radiographs should be avoided. Extra-oral radiographic techniques such as panoramic radiography and cone beam computed tomography (CBCT) can be used alternatively during COVID-19 pandemic.[25]

Pre-operative mouth rinse

It has been reported that the use of pre-operative antimicrobial mouth rinse reduces the microbial count in the oral cavity hence decreasing the possible risk of transmission of infection during dental care[26]. The Indian Endodontic Society (IES) and National Health Commission of the People's Republic of China have highlighted the ineffectiveness of 0.2% CHX against SARS-COV-2 and have recommended the use of 1% hydrogen peroxide or 0.2% povidone-iodine as pre-procedural mouth rinse.[27,28] It can be concluded that the hydrogen peroxide or povidone-iodine are the most recommended mouth rinses.

Rubber dam isolation

The virus load in human saliva is very high, pre-operative oral rinse can only reduce it but cannot eliminate. It has been reported that rubber dam isolation can significantly reduce airborne particles in 3-foot diameter of the operational field by 70%.[29] Using rubber dam is recommended in several published guidelines, not only for endodontics procedures, but for almost all AGPs when possible.[27]

It is highly advisable to use dental rubber dam with high volume saliva ejectors, and four-handed dental assistance to reduce SARS-CoV-2 transmission risk.

Use of anti-retraction handpiece
Using a high-speed dental handpiece with anti-retraction valve is proven to reduce the backflow of the hepatitis B virus and oral bacteria into the dental handpiece tube much more effectively than a dental handpiece with no anti-retraction properties. Thus, handpiece with anti- retracting valves is recommended during this COVID-19 outbreak so as to provide an additional preventive measure.[30]

Filtration of contaminated air
There are many methods to filter contaminated air in treatment areas; the two most commonly used devices include the inexpensive high volume evacuator (HVE) and the expensive high efficiency particulate arrestor (HEPA) filters.

HVE filter: It is a suction device which removes air at a rate of up to 2.83 m^3 per minute. It is the easiest way to remove dental aerosols as they are generated and could effectively reduce contamination caused by the operating site by 90%.[31] However, the device should be held at a proper distance (approximately 6–15 mm) from the active ultrasonic tip. Limitation of the HVE is that without a dental assistant, clinicians might face difficulty in operating it using one hand.

HEPA filter: It is an air filtration device which removes 99.97% of the particles measuring 0.3 μm in diameter. One disadvantage is that the filter may become a source of microbes if the retained microorganisms proliferate and enter back into the filtered air.[32] In addition, soiled HEPA filters are difficult to clean and expensive to replace.[33]

Surface disinfection
Droplet with infective pathogens may be collected on the surrounding surfaces during AGPs. Surface disinfectants such as 62%–71% ethanol, 0.5% hydrogen peroxide, and 0.1% (1 g/L) sodium hypochlorite can be used.[34] Surfaces are disinfected after each patient visits, particularly surfaces in close proximity to the operating areas. After dental treatment of each patient, dental professionals should allow exit of a patient, delay entry into the operatory area and wait for 15 minutes to begin cleaning and disinfection of the room surfaces.[12]

Precautions for managing emergencies of potentially exposed or confirmed COVID-19 Patients.
A symptomatic COVID-19 patient is unlikely to visit a dental clinic. However, if the patient visits due to a dental emergency, it is recommended that the patient should be referred to a facility fitted with separate airborne infection isolation rooms (AIIRs).[35] AIIRs are single-patient rooms at negative pressure relative to the surrounding areas, and with a minimum of 6 air changes per hour. As mentioned above HEPA filter should be integrated to filter air directly before recirculation. Furthermore, furniture and equipment in the room should be minimal and those essential for the operating procedure should be present. Rooms should be always closed, and entry/exit should be minimized.

Both the CDC and ADA, have given instructions that recovered COVID-19 patients can be seen in normal clinic setting for dental emergencies only. Recovery is defined as at least 3 days (72 hours) since resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms, such as cough, shortness of breath, and at least 10 days since symptoms first occurred.[18]

Management of biomedical waste
Medical and domestic waste should be marked and predisposed in accordance with the Biomedical Waste Management and Handling Regulations 2016, 2018.[36,37] Medical and dental waste, along with protective equipment, should be collected and transferred from the office in a timely manner to a temporary storage area. Infectious waste from the treatment of suspected or confirmed cases of COVID 19 should be packed in double layer yellow packages of medical waste and disposed accordingly.[29]

Post pandemic dental practice
Practice of dentistry will be irreversibly affected by the COVID- 19 pandemic, until a successful antiviral agent or a vaccine is found for the disease. However at this stage it is difficult to understand the 'new reality' of post-pandemic dentistry.

The foregoing is a provisional and a rather brief account of the reasonable, key features of post pandemic patient management. Definitive recommendations and guidelines on this subject should be developed by local and regional health authorities.

Conclusion:-

There is still limited information in the scientific literature on the protocol to be practised by pediatric dentists for the management of emergency dental procedures in children during outbreak of COVID-19. However, the clinical manifestations of COVID -19 in children are less severe than adults but young children principally infants pose a greater transmission risk. Thus, strict protection protocols of the patients and environmental disinfection becomes crucial in order to minimize the risk.

This pandemic marks beginning of a new era for using different methods of approach and behavior management in pediatric dentistry. Preventive dentistry should be encouraged and minimal invasive procedures should be implemented to reduce aerosol production. Finally, since the COVID-19 situation continues to evolve day by day, pediatric dentists need to update themselves according to the guidelines put forward by reliable and reputable dental authorities, which are appropriate for their own region, thus minimizing the risk and preventing the spread of infection.

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None.

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