



COVID-19, Various Treatment Options and Special Considerations for Dentistry

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Authors' contributions

This work was carried out in collaboration among all authors. Author SSB conceptualization, methodology, data curation. Author SA writing original draft preparation, visualization and investigation. Author AB reviewing and editing the paper. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2020/v32i1030494

Editor(s):

(1) Dr. Q. Ping Dou, Barbara Ann Karmanos Cancer Institute, Wayne State University, USA.

Reviewers:

(1) Huma Qureshi, Doctors Plaza, The Plaza, Pakistan.

(2) Li Gang, Institute of Animal Sciences, Chinese Academy of Agricultural Sciences, China.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/58090>

Review Article

Received 30 May 2020

Accepted 18 June 2020

Published 30 June 2020

ABSTRACT

Objective: The aim of this article is to analyze the epidemiology of COVID-19, comparison of routes of transmission in children and adults, comparing the clinical symptoms in adults and children, treatment protocol to be followed and possible treatment options during this pandemic.

Data Sources: Data is collected from Pubmed, Medline and Embase databases.

Discussion from Previous References Used: Few studies have been done to analyze its effect on children comparing the symptoms of adults and children. Also very less work is done to analyze the special precautions taken while doing dental treatment during this pandemic.

Conclusion: The widespread effect of Coronavirus (COVID-19) or SARS-CoV-2 has created health concerns in the world. Although efforts have been taken to control the disease, it is still increasing due to the community spread. Health professionals may get patients in their practice with this infection and should prevent its spread.

Clinical Significance of this Article: It will help us to differentiate the specific clinical symptoms of adult and pediatric patients coming to dental clinics and the special considerations for them including the emergency dental treatment during COVID-19.

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Keywords: COVID-19; SARS-CoV-2; Centers for Disease Control and prevention (CDC); Personal Protective Equipment (PPE); primary management; secondary management.

1. INTRODUCTION

The outbreak of COVID-19 has spread very fast and developed in a health crisis [1]. It has spread to almost all countries. It comes from a RNA family of viruses which is single-stranded and is called Coronaviridae. World Health Organization had expressed concern over the rampant spread of this viral infection as an emergency with the overall mortality rate being reported as 3.4% [2]. The infection also spreads to health care providers including medical doctors dentists and nurses. Its risk is especially high in dental professionals as they are at a very high risk of infection due to dental procedures that include aerosol generation [3]. Also its effect on the pediatric population has also not been thoroughly analyzed.

2. ORIGIN AND SPREAD OF COVID-19

Coronavirus is a type of RNA virus, its size is approximately 60 to 140 nm in diameter and it has spikes which gives it a shape like a crown; hence it is called as coronavirus. In December 2019, few patients in the city of Wuhan, China reported to the hospital with severe pneumonia. This disease had started from the wholesale seafood market of Wuhan that also sold wild animals. This virus was identified having similarity as 95% with the bat coronavirus and more than 70% with the SARS-CoV. Later, the human-to-human transmission started occurring. Cases gradually continued to increase and it was reported that this disease had a doubling time of 1.8 days [4].

3. SYMPTOMS AND CLINICAL FINDINGS IN PEDIATRIC AND ADULT PATIENTS

Clinical symptoms of the adult patients that have this infection are generally cough, myalgia and fever or fatigue along with abnormal chest x ray showing lesions in multiple lung lobes and is diagnosed by computerized tomography, while less common symptoms included headache, sputum, hemoptysis and diarrhea. It has more chances to affect older males with pre-existing chronic diseases like cardiovascular diseases or in immunocompromised individuals and causes severe respiratory diseases [5]. Clinical symptoms of pediatric patients are almost the same as adults like cough and fever but are mild. Few children can also have mild diarrhea, nasal

congestion and running nose [6]. Children may also have symptoms of fatigue, abdominal pain and discomfort, nausea, vomiting, infections of upper respiratory tract, erythema of pharynx [7]. COVID-19 infection in neonates, infants and children is usually milder than adults [4]. Children who are immunocompromised or with some systemic disease may be more prone to the infection. As the symptoms in almost all of the pediatric patients are mild, lesions are not visible in chest X-ray, and it leads to diagnosis being wrong or missed. Hence, CT examination of the chest is important that typically shows either one or both sided sub pleural ground-glass shaped radiopacities. Pleural effusion is usually not observed [6]. Children usually don't have trouble in breathing and do not need oxygen. As a large number of pediatric patients might be asymptomatic or with mild disease only, hence the actual number of infected children might be higher than reported in an area. Although it is still unknown as to why children appear to have milder symptoms of this disease [8]. To sum up, CT of chest and proper follow-up, along with detection of the pathogen with the help of molecular tests is the standard protocol in pediatric patients [6].

4. PATHOGENESIS OF COVID-19

All ages including adults and children are equally prone to this infection that is usually transmitted through air droplets that are transmitted by patients who cough and sneeze when in contact with other people. It can be transmitted from those people also who are asymptomatic even before they show clinical symptoms [4]. Incubation period is generally from 0-24 days, hence person to person transmission may occur before any symptoms are seen in the patient. It can also spread by various objects that might be touched by the patient and then later touched by other people. The virus remains viable for 24 hours on cardboard to up to 3 days when it is present on metal or plastic. Thereby, disinfecting the various inanimate objects and washing of hands frequently is important to prevent the spread of this disease [9]. Also, since people touch their faces very frequently, like on an average of 23 times in one hour, and 44% involve the mucous membranes of nose and mouth. Hence it is very important to regularly clean the hands with soap or sanitizers [10]. In patients, average duration of shedding of virus

was 20 days [11]. This virus can attach itself to human angiotensin converting enzyme 2 positive cells, that are generally present in high numbers in salivary glands and thereby in secretory saliva [12]. Therefore, it spreads via aerosol, or by air droplets in the dental office. As children show mild symptoms, they should always be taken at potential risk of infection; hence all precautions of infection control should be followed. When patients in the dental clinic cough, sneeze, or get the dental treatment done that use a dental hand piece or other aerosol-generating instruments like ultrasonic cleaners, it aerosolizes their saliva and blood in the surrounding air. Dental chair, spittoon, chair handle, three-way syringe and the diagnostic and treating instruments being used can also be contaminated with the COVID-19 virus and as it stays on them for a prolonged period of time, it becomes a source of infection to the other patients, dentists and other dental staff and personnel. Infections can also occur due to direct contact between patient's oral cavity and dentist's hands that get contaminated with the virus while doing the treatment. Hence dental clinics and dental setting is a major source of infection in the spread of this disease [13].

5. LABORATORY INVESTIGATIONS

Diagnosis is done by identifying the virus in respiratory secretions with the help of special molecular tests. Although this test result can usually come negative in children [6]. Common findings in adults include marked increase in C-reactive protein and the count of platelets is normal or it may be slightly decreased. The Alanine /aspartate aminotransferase, creatinine, D-dimer, prothrombin time, creatine phosphokinase and lactic acid dehydrogenase may be increased in severe disease [4]. Adults suffering from COVID-19 had significantly lower lymphocyte counts [14]. While in children, studies have reported lymphocyte count to be normal in some cases, decreased in some cases, and increased along with the increase in alanine aminotransferase, C-reactive protein and creatine kinase in a few cases [6,15]. The most commonly used test for COVID-19 is the nasal swab test, in which the doctor sticks a long swab into one or both the nostrils to collect the diagnostic sample. Similarly, the throat, or oropharyngeal, test swab takes a sample from the back of the throat [16]. The COVID-19 RT-PCR test is a reverse transcription-polymerase chain reaction test for detecting nucleic acid from SARS-CoV-2 in upper and lower respiratory specimens [17].

6. MEDICAL MANAGEMENT OF COVID-19

Treatment is done as both supportive and symptomatic. The basic principle of treatment in both adults and children is to maintain hydration and nutrition and to control fever and cough. WHO has recommended that all patients of COVID-19 that are also suffering from acute respiratory distress syndrome (ARDS), provision of oxygen should be there and offered extracorporeal membrane oxygenation (ECMO) [18]. Fluid management reduces pulmonary oedema. Antibiotics can be used if secondary bacterial infection is present [19]. Antiviral drugs should be administered that can reduce the transmission of infection by decreasing viral shedding of symptomatic patients. The antimalarial drug, hydroxychloroquine has also shown good antiviral activity against coronaviruses [20]. Patients should be discharged from the hospital once they do not have fever for consecutively 3 days and also have two negative molecular test results at the interval of 1 day [4]. Routine antibacterial therapy should be used in pediatric patients. The difference in the prognosis of children is that children usually have a good prognosis with the hospital stay of about 12.9 days [6].

7. PREVENTION AND REDUCING TRANSMISSION OF COVID-19

Isolation of people should be done who have travelled to a country that has this infection for at least 14 days. There is also a strong need to prevent people at high risk from this infection, the people in their close contacts and doctors and other health care personnel [20]. Old people should be socially isolated during this pandemic due to their high risk of cardiovascular, neurocognitive and autoimmune problems [21]. Isolation of suspected cases should be done at home. The room should be properly ventilated with the availability of sunlight for inactivating the virus. Patient should wear a mask, especially when in contact with other family members and also practice hygiene related to coughing and sneezing. The people who are attending to these patients should also use masks when they are in contact with the patient and follow proper hand hygiene [4]. Kids should be kept away from adults and elderly sick people, or people with underlying systemic diseases and also if they are suffering from respiratory problems [22]. Researches about COVID-19 that are published in various medical journals should be shared as it

will be of great help [23]. Health care professionals and intensive care units are needed at a large scale in the fight against COVID-19 [24].

8. DENTAL MANAGEMENT

Dental chairs and all dental instruments should be properly cleaned and sterilized after every use. Online or via the phone dental consultations can be done during this period for patients with an emergency condition [25]. Personal protective equipment (PPE) and N95 masks should be used by the dentists and nursing staff every time while doing a case [15]. The cleaners should also use these masks. Disposable head cap and foot covers should also be used. The sequence of putting on PPE should be first gown, then a respirator or mask, after that eye goggles or face shield and at the last gloves. And while removing at first gloves should be removed, then goggles, then gown and after that mask or respirator and at the end hands should be washed with an alcohol base hand sanitizer [26]. Centers for Disease Control and Prevention (CDC) and American Dental Association (ADA) has given instructions to treat only emergency procedures during this time of rapid infection to prevent its spread. Number of patients should be checked for clinical signs and symptoms of any respiratory problem. All procedures that generate aerosols like in dentistry, should be avoided so that the spread of germs by air droplets does not take place. Individuals in whom the COVID-19 is suspected should be asked to consult a physician to check for any chance of infection [1]. Conditions that require emergency dental treatment include only acute and severe pain in case of irreversible pulpitis, acute swelling or

abscess and traumatic dental injuries [27]. Twice brushing daily with a fluoridated toothpaste should be stressed upon to be followed by our patients to avoid the development of new carious lesions [28]. Common medications used in case of adults and children for acute abscess and pain control is discussed in Tables 1 and 2 [1,29]. Sequence to be followed while treating our dental patients during COVID-19 is discussed in Table 3 [1].

9. DISCUSSION

It was predicted in some studies by a group of doctors and scientists in 2007 that coronaviruses can undergo recombination of genetic material, that may in future lead to the emergence of some new genotypes and may a cause dangerous outbreak. This along with the presence of viruses like SARS-CoV in bats, along with the habit of eating wild animals mostly mammals in China, was predicted to be very dangerous like a future catastrophe. Hence it was documented and warned by the scientists that there could be a reemergence of SARS or some other kind of viruses [30]. A study was done in the year 2017 by a group of scientists in Mimi village of Nagaland, India studied various filoviruses present in bats and also proved the chances of zoonotic transmission of these from bats into human beings [31]. According to a recent report published in Harvard Business Review, lessons that the world needs to learn from this disaster are to practice social distancing, extensive testing of all suspected cases at a large scale and also, collection and sharing of all the available data on this disease among all the nations is very important [32].

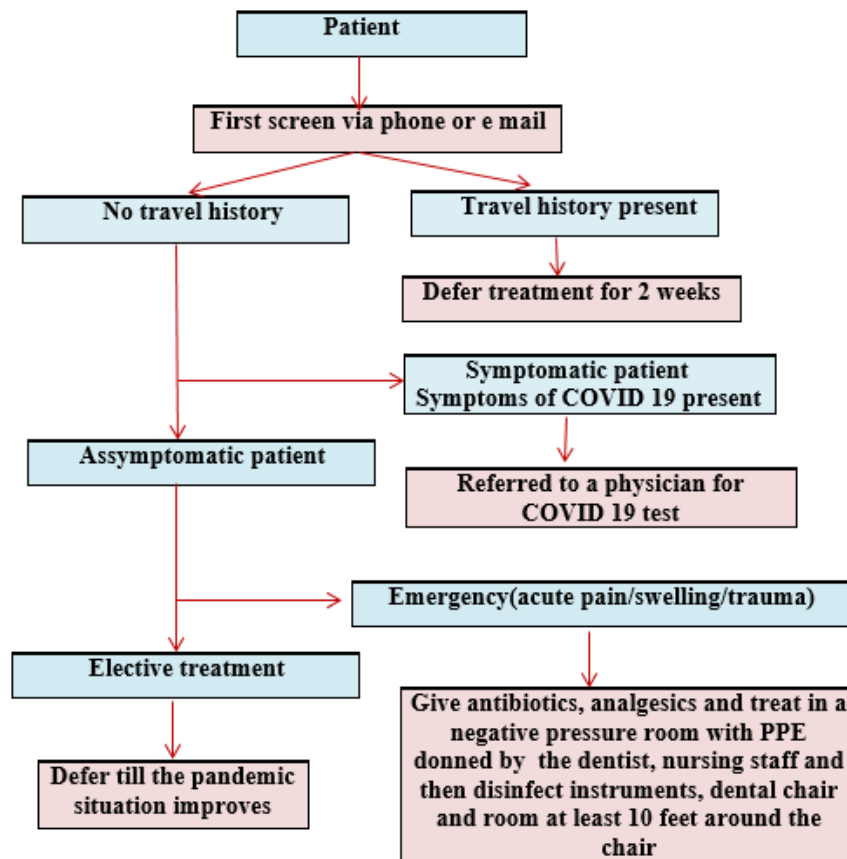
Table 1. Common analgesics used during COVID- 19 [1,29]

A. Analgesics used most commonly for adults in case of pain in a tooth	
Acetaminophen	Ibuprofen
250-500 mg (4-6 hourly)	400-600 mg (4-6 hourly)
B. Analgesics used for pediatric patients in case of pain in a tooth	
Acetaminophen	Ibuprofen
Usual oral dosage-	Usual oral dosage-
I. Children < 12 years: 10-15 mg/kg/dose every 4-6 hours as needed.	I. Children < 12 years: 4-10 mg/kg/dose every 6-8 hours
{Do not exceed 5 doses (2.6 g) in 24 hours}	
II. Children > 12 years & adults: 325-650 mg every 4-6 hours as needed	II. Children > 12 years: 200 mg every 4-6 hours as needed
(not to exceed 4g/day)	(maximum 1200 mg/24 hrs)

Table 2. Common antibiotics used during COVID -19 [1,29]

A. Common antibiotics used for adults in case of abscess in a tooth		
Augmentin	Cephalexin	
500 mg (every 6 hours)	250 mg (every 6 hours)	
B. Common antibiotics used for children in case of abscess in a tooth		
Amoxicillin	Amoxicillin clavulanate (Augmentin®)	Cephalexin
Usual oral dosage: I. Children > 3 months of age up to 40 kg: 20-40 mg/kg/day in divided doses every 8 hours OR 25-45 mg/kg/day in divided doses every 12 hours II. Children > 40 kg & adults: 250-500 mg every 8 hours OR 500-875 mg every 12 hours III. Endocarditis prophylaxis : 50 mg/kg (maximum 2 g 30-60 minutes before dental procedure)	Usual oral dosage I. Children > 3 months of age up to 40 kg: 25-45 mg/kg/day in divided doses every 12 hours II. Children > 40 kg & adults: 500-875 mg every 12 hours	Usual oral dosage I. Children: 25-50 mg/kg/day in divided doses II. Endocarditis prophylaxis 50 mg/kg (maximum 2 g) 30-60 minutes before procedure

Table 3. Sequence to be followed while treating our dental patients during COVID -19 [1]



10. CONCLUSION

Panic should be avoided in the public by creating awareness. This new virus has threatened the health sector and has created an economic crisis in all countries. Time will tell us as up to what extent, this deadly virus will affect our lives. In future also, these zoonotic viruses may pose a threat to our existence. Hence, along with controlling this present infection, efforts should also be done to curb any future pandemic outbreak.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

ACKNOWLEDGEMENT

The authors would like to thank the Deanship of Scientific Research at Majmaah University for supporting this work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/58090>