Journal of Research in Medical and Dental Science
2021, Volume 9, Issue 9, Page No: 116-121

Available Online at: www.jrmds.in
eISSN No.2347-2367: pISSN No.2347-2545

The Coronavirus Disease 2019 (COVID-19) Outbreak: Challenges for Pediatric Dentistry

Manal Ali Almutairi*

Department of Dentistry and Orthodontics, Dental College, King Saud University, Riyadh, Saudi Arabia

ABSTRACT

The most recent Severe Acute Respiratory Syndrome has become a major global public health emergency, which the World Health Organization has identified as the novel coronavirus disease 2019 (COVID-19). Despite international attempts to prevent the virus from spreading, the epidemic has not yet been halted. Among healthcare workers, dentists seem to be at a higher risk of exposure to COVID-19. Given the type and form of procedures being performed in the oral cavity, pediatric dentistry poses a significant occupational risk. This review article discusses the risk of infection during dental procedures, patient precautions, and infection control measures implemented during dental care in hospitals, protective measures for dental practitioners, and emergency dental treatment during the COVID-19 pandemic. And provide a variety of treatment options for children who are at risk for COVID-19, as well as precautions that must be taken to avoid cross-infections while children undergo emergency treatments in dental offices.

Key words: Paediatric dentistry, Dental practice management, COVID-19, Dentist, Dental practice

HOW TO CITE THIS ARTICLE: Manal Ali Almutairi, The Coronavirus Disease 2019 (COVID-19) Outbreak: Challenges for Pediatric Dentistry, J Res Med Dent Sci, 2021, 9(9): 116-121

Corresponding author: Manal Ali Almutairi
e-mail ✉ :malmutairi1@ksu.edu.sa
Received: 17/08/2021
Accepted: 02/09/2021

INTRODUCTION

The human body is exposed to a variety of infectious microorganisms, such as viruses, bacteria, fungi, protozoa, and helminths, which cause tissue damage through different mechanisms. Viruses are unique among these five types of infectious organisms in that they can manipulate the host-cell machinery in a unique way and continuously evolve to survive and prosper in all species [1].

By the end of 2019, Coronavirus disease 2019 (COVID-19) was the most recent infectious disease to rapidly develop worldwide [2]. The World Health Organization (WHO) classified the 2019 novel coronavirus (2019-nCoV) as a beta-Coronavirus (β-CoV) of group 2B, belonging to the subfamily Orthocoronavirinae [3]. The genetic attributes of the 2019-nCoV are nearly identical to those of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and Middle East respiratory syndrome coronavirus (MERS-CoV), which originated from bats [3]. COVID-19 has its etiologic agent (SARS-CoV-2): the 2019 coronavirus is different from SARS-CoV, but it has the same host receptor, human angiotensin-converting enzyme 2 (ACE2) [2].

The COVID-19 outbreak was discovered in Wuhan, China [2]. In Wuhan City, wet animal markets are a source of live animals and were largely concerned in a high number of positive cases, pointing to the zoonotic origin of 2019-nCoV [4]. The sudden appearance of an unidentified disease in wet animal markets characterized by several symptoms, including pneumonia, dry cough, fatigue, and occasional gastrointestinal symptoms [2]. The initial outbreak was identified and involved approximately 66% of the workers there. The virus has since been transmitted rapidly from Wuhan city to most other cities, provinces, and countries throughout the world [2].

On January 30, 2020, the WHO declared a global public health emergency over the COVID-19 outbreak [5,6]. Efforts were made to identify the reservoir for transmission to humans, with preliminary evidence suggesting two species of snakes [3]. However, a lack of concrete data identifying the coronavirus reservoir as something other than birds and mammals remains [4]. The cause of the spread of COVID-19 infections has been identified as via person-to-person transmission [3,4]. The basis of this conclusion lies in the fact that many cases were identified within individuals who had never visited Wuhan's wet animal markets. Direct contact with an infected individual and the spread of infection via droplets, either by sneezing or coughing, are the two most important modes of person-to-person transmission [4].

Dental practitioners face significant difficulties as a result of the characteristics of spread infection in COVID-19 and the features of dental procedures. Cross contamination between dental practitioners and patients is a possibility due to the exposure of individuals to droplets and aerosols

from saliva and other body fluids during dental procedures. Concerns about a similar route of transmission for COVID-19 in the dental setting have grown because of these routes of transmission [7]. When dealing with children and teenagers, the situation worsens. According to recent research, the majority of children who contract the COVID-19 are asymptomatic and can play a significant role in transmission [8,9].

Given the above data, this review article discusses the risk of infection during dental procedures and provides a variety of treatment options for children who are at risk of COVID-19. This article also details the precautions that must be taken to avoid cross-infections while treating children in dental offices during an emergency.

Covid-19 and children

The case detection rate changes daily and can be tracked in almost real time [10]. As of 22 March 2021, 22:25 hours (Central Standard Time), the number of confirmed cases in the world was 123 527 951 and the number of reported deaths was 2 719 828, with 69 977 363 recovered patients [10]. There is a low prevalence of COVID-19 infections among children; however, the true numbers are likely to be under-reported [11].

Children, especially those between the ages of 12 and 14 years, appear to be affected less frequently than adults [12-20], as they have a lower risk of exposure and are tested less frequently than adults [21]. Children account for up to 14% of laboratory-confirmed cases in different countries [22-29]. Most cases of COVID-19 in children include family contact, and a confirmed diagnosis of the infection [30,31]. Thus, children are just as likely as adults to become infected, but with fewer complications and a lower risk of severe illness. The phases include asymptomatic, mild, moderate, severe [31].

Impact of COVID-19 on dentists and pediatric dentists

The first case of a dentist testing positive for COVID-19 was on 23 January 2020 at the Department of Preventive Dentistry in the Wuhan University Dental Hospital. Eventually, disease transmission to eight other oral healthcare professionals was identified [32].

The dental clinic was not difference for a similar possibility of transmitting and acquiring the infection between staff or individuals; moreover, dental clinics could be riskier environments for disease spread due to the necessity for close contact with patients and the nature of dental treatments [33]. Individuals working in dental practices are at an increased risk of infection due to the requirement for face-to-face communication, the handling of sharp instruments, and the exposure to saliva, blood, and other body fluids. Dental professionals also play an important role in preventing the transmission of 2019-nCoV [34].

As countries experienced the pandemic at different periods, it is difficult to analyze the true impact of the pandemic on pediatric dental practice [11]. Due to this emergent outbreak and difficulties in screening patients for COVID-19, dentists do not know when they are encountering infected patients.

Seasonal flu is common among children, and with the changing weather, cold and cough have also become extremely prevalent. Notably, flu and colds present with overlapping symptoms of COVID-19, thus, complicating the diagnosis of COVID-19 [35]. In general, children in pediatric dental offices are unable to describe their symptoms. Thus, during this time of crisis, many symptoms may overlap and correlate with other viral illnesses, creating diagnostic confusion. The inability to definitively diagnose COVID-19 infections from other illnesses thus creates a fear of exposure among pediatric dentists while performing treatments [35]. Therefore, pediatric dentists are urged to remain up to date with recent international and local institutional guidelines. Any practice modifications should be evaluated using professional clinical judgment [11].

To control the spread of COVID-19, practical guidelines have been recommended for dentists and dental staff by the Centres for Disease Control and Prevention (CDC), the American Dental Association (ADA), the World Health Organization and the Ministry of Health of the Kingdom of Saudi Arabia [36-39]. Similar to the situation with other transmissible diseases, such recommendations include the use of personal protective equipment, routine hand washing, detailed patient evaluations, the use of rubber dam isolation, the use of high-speed hand pieces, mouth rinsing before dental procedures, and routine disinfection of the clinic. In addition, some guidelines and reports provided useful information about the signs and symptoms of COVID-19, the routes of transmission, and update recommendation to increase dentists' knowledge of prevention practices to contribute at a population level to disease control and prevention [32,36,39].

In the wake of the COVID-19 outbreak, various organizations, such as the American Dental Association (ADA) [35] and the American Dental Hygienists' Association (ADHA) [40] have recommended postponing all elective dental procedures and noncritical dental care. Similarly, the Centres for Medicare and Medicaid Services (CMS) [41] recommend that all nonessential dental examinations and procedures be postponed until further notice.

With restrictions in dental practice during the COVID-19 pandemic, Minimal Intervention Dentistry (MID) has several advantages as it exposes patients to lower risk aerosols, reduces the need for local anaesthesia, and can be performed over a short period of time [42]. The Atraumatic Restorative Technique (ART), resin infiltration, the application of sealants, silver diamine fluoride (SDF) application, the chemo-mechanical removal of caries, and the Hall technique are examples of minimally invasive approaches [44,45].

Atraumatic restorative technique (ART)

The WHO has approved the ART as a method of repairing and preventing caries in people who do not have access

to conventional dental services [45]. The ART technique includes the excavation of caries using only hand tools and restoring the cavity with high-viscosity glass ionomers cement [46]. It is a time-tested method of providing restorative services to children, with high success rates [47]. For young children who are afraid of traditional drills and local anaesthesia, the ART procedure is extremely beneficial [48]. Also, due to the low risk of aerosol production, the ART method can be considered as the first treatment choice for repairing carious lesions in primary and permanent teeth [46]. However, the ART procedure is only used in situations when there is no visible pulpal exposure, a history of sore teeth, and a deep carious lesion where the dentist believes that excavating carious tissue would not expose pulp or tooth areas open to hand instruments [49]. Despite these drawbacks, the ART technique is a secure and efficient way to restore teeth during a COVID-19 pandemic since it is classified as a reduced Aerosol Generating Procedure [50].

Resin infiltration

Resin infiltration is a procedure that involves filling the interproximal areas of teeth that contain non-cavitated carious lesions with a low-viscosity composite resin. Inside the lesion, the resin creates a diffusion shield. Cavity cutting and temporary tooth separation are not necessary in this technique. While the evidence detailing the long-term benefit and usefulness of resin penetration in preventing or arresting carious lesions is mixed, this method can be useful in the current situation during a COVID-19 [51].

Sealants

The majority of carious lesions in infants, teens, and young adults are pit and fissure caries. Non-cavitated carious lesions may be stopped or reversed by filling such pits and fissures on the occlusal surface of the tooth with a low-viscosity composite material. Bacteria present in such a sealed tooth were found to be smaller than those excavated from a typical carious lesion. As no cutting of the tooth surface is typically required for this method, dentists can reduce the level of aerosols produced before applying the sealant. The efficacy of the sealant at avoiding caries is backed by data of modest consistency. This preventative technique was used before the pandemic and can be used after as it may avoid or prevent the development of new caries [52,53].

Silver diamine fluoride (SDF)

SDF is a non-restorative caries control method. The use of a 38% SDF solution twice per year has been shown to inhibit and/or prevent coronal caries in the primary teeth of preschool children, as well as on the root surfaces of permanent teeth in adults. This treatment results in the blackish discoloration of teeth, and thus, it may not be suitable for all patients, or in the anterior teeth [54-56]. Non-restorative caries control is common, but a renewed focus during the current and post-COVID-19 era is critical.

Chemo-mechanical removal of caries

The chemo-mechanical removal of caries is a non-invasive procedure that uses a chemical agent to remove the infected dentin. It is a dissolution-based process wherein, instead of drilling, gentle excavation with hand tools, such as excavators may be used to remove the softened material. Caridex, carisolv, and papacarie are popular agents for chemo-mechanical cavity preparation (papain gel). This technique is effective in the treatment of fearful and medically compromised patients, as well as in patients who contraindicated local analgesics. The use of an airotor for the final restoration of the tooth can be reduced by chemical softening of the carious tissue [57].

The hall technique

In 2006, Dr. Norna Hall of Scotland introduced the Hall Crown Method, which uses preformed metal crowns [58]. The Hall technique is a non-invasive, non-aerosol-producing procedure for restoring a child's carious, yet asymptomatic, primary molar. It requires the insertion of a stainless-steel crown over a carious posterior primary tooth, without the removal of carious tissues.

Caries is stopped when bacteria in the carious lesion die due to the lack of nutrients. In the COIV-19 pandemic, where we want to reduce aerosol production, the Hall technique can be very useful [59]. Similar to the situation with SDF, no cavity preparation is needed with the Hall technique.

The challenges in this pandemic will be countless. However, with flexibility, knowledge, and a continual adaptation process, pediatric dentists will face these challenges and continue to strengthen the profession in the future [60]. The return to elective procedures in pediatric dentistry will continue to require the use of enhanced personal protective equipment (PPE) [9,61-63]. It is believed that this new routine of dawning PPE can cause unfamiliarity to children demanding humanized care and necessitate behavior management before and during procedures [64].

CONCLUSIONS

COVID-19 has caused worldwide health problems. Despite attempts to contain the disease, it continues to spread through the population. COVID-19 infections are rare among children, but the true figures are likely underestimated. Pediatric dentists must remain current with international and local institutional recommendations because countries faced the pandemic. Where appropriate, non-aerosol and minimally invasive methods in removing caries would be preferred.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

COMPETING INTERESTS

The author has no conflicts of interest in relation to this work.

FUNDING

Nil.

ACKNOWLEDGMENTS

The author thanks the College of Dentistry, King Saud University, Riyadh, KSA for providing the facilities used to carry out this study. The research was registered (NF-0587) at King Saud University's College of Dentistry Research Center (CDRC).

REFERENCES

1. Caspar DLD. Design principles in virus particle construction. In: Horsfall FL, Tamm I., editors. Viral and Rickettsial Infections in Man. 4th ed., Philadelphia: JB Lippincott 1975.
2. Spagnuolo G, De Vito D, Rengo S, et al. COVID-19 Outbreak: An Overview on Dentistry. Int J Environ Res Public Health 2020; 17:2094.
3. Cui J, Li F, Shi ZL. Origin and evolution of pathogenic coronaviruses. Nat Rev Microbiol 2018; 17:181–192.
4. Zhu N, Zhang D, Wang W, et al. China novel coronavirus investigating and research team. A novel coronavirus from patients with pneumonia in China. N Engl J Med 2019; 382:727–733.
5. Wu YC, Chen CS, Chan YJ. The outbreak of COVID-19: An overview. J Chin Med Assoc 2020; 83:217–220.
6. Peng X, Xu X, Li Y, et al. Transmission routes of 2019-nCoV and controls in dental practice. Int J Oral Sci 2020; 12:9.
7. Ibrahim NK, Alwafi HA, Sangoof SO, et al. Cross-infection and infection control in dentistry: Knowledge, attitude and practice of patients attended dental clinics in King Abdulaziz University Hospital, Jeddah, Saudi Arabia. J Infect Public Health 2017; 10:438–445.
8. Cagetti MG, Cairoli JL, Senna A, et al. COVID-19 outbreak in north Italy: an overview on dentistry. A questionnaire survey. Int J Environ Res Publ Health 2020; 17:3835.
9. Al-Halabi M, Salami A, Alnuaimi E, et al. Assessment of paediatric dental guidelines and caries management alternatives in the post COVID-19 period. A critical review and clinical recommendations. Eur Arch Paediatr Dent 2020; 1-14.
10. https://coronavirus.jhu.edu/map.html
11. Ismail AF. Managing pediatric dental patients during the SARS-CoV-2 pandemic. J Int Oral Health 2020; 12:80-84.
12. Dong Y, Mo X, Hu Y, et al. Epidemiology of COVID-19 among children in China. Pediatrics 2020; 145.
13. Lu X, Zhang L, Du H, et al. SARS-CoV-2 Infection in children. N Engl J Med 2020; 382:1663.
14. Wei M, Yuan J, Liu Y, et al. Novel coronavirus infection in hospitalized infants under 1 year of age in China. JAMA 2020; 323:1313.
15. CDC COVID-19 response team. Coronavirus disease 2019 in children-United States, February 12-April 2, 2020. Morb Mortal Wkly Rep 2020; 69:422.
16. Zimmermann P, Curtis N. Coronavirus infections in children including COVID-19: An overview of the epidemiology, clinical features, diagnosis, treatment and prevention options in children. Pediatr Infect Dis J 2020; 39:355.
17. de Lusignan S, Dorward J, Correa A, et al. Risk factors for SARS-CoV-2 among patients in the oxford royal college of general practitioners research and surveillance centre primary care network: A cross-sectional study. Lancet Infect Dis 2020; 20:1034.
18. Viner RM, Mytton OT, Bonell C, et al. Susceptibility to SARS-CoV-2 infection among children and adolescents compared with adults: A systematic review and meta-analysis. JAMA Pediatr 2021; 175:143.
19. Munro APS, Faust SN. Addendum to: Children are not COVID-19 super spreaders: time to go back to school. Arch Dis Child 2021; 106:e9.
20. Li F, Li YY, Liu MJ, et al. Household transmission of SARS-CoV-2 and risk factors for susceptibility and infectivity in Wuhan: A retrospective observational study. Lancet Infect Dis 2021.
21. https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/transmission_k_12_schools.html
22. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72 314 cases from the chinese center for disease control and prevention. JAMA 2020; 323:1239.
23. www.statista.com/statistics/1103023/coronavirus-cases-distribution-by-age-group-italy/
24. www.statista.com/statistics/1102730/south-korea-coronavirus-cases-by-age/
25. Posfay-Barbe KM, Wagner N, Gauthey M, et al. COVID-19 in children and the dynamics of infection in families. Pediatrics 2020; 146.
26. Docherty AB, Harrison EM, Green CA, et al. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO clinical characterisation protocol: Prospective observational cohort study. BMJ 2020; 369.
27. Stokes EK, Zambrano LD, Anderson KN, et al. Coronavirus disease 2019 case surveillance-United States, January 22-May 30, 2020. Morb Mortal Wkly Rep 2020; 69:759.
28. www.cdc.gov/covid-data-tracker/index.html#demographics
29. services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/children-and-covid-19-state-level-data-report/

30. Zhonghua Liu, Xing Bing, Xue Za Zhi. Epidemiology working group for NCIP epidemic response, Chinese center for disease control and prevention. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China. 2020; 41:145-151.
31. Cui Y, Tian M, Huang D, et al. A 55-Day-Old Female Infant infected with COVID 19: presenting with pneumonia, liver injury, and heart damage. J Infect Dis 2020; 221:1775-1781.
32. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (Covid-19): Emerging and future challenges for dental and oral medicine. J Dent Res 2020; 99:481-487.
33. Zemouri C, de Soet H, Crielaard W, et al. A scoping review on bio-aerosols in healthcare and the dental environment. PLoS One 2017; 12:e0178007.
34. Wadia R. Transmission routes of COVID-19 in the dental practice. Br Dent J 2020; 228:595.
35. American Dental Association. ADA recommending dentists postpone elective procedures. 2021.
36. https://www.who.int/publications/i/item/WHO-2019-nCoV-clinical-2021-1
37. https://www.cdc.gov/oralhealth/infectioncontrol/statement-COVID.html.
38. https://success.ada.org/en/practice-management/patients/coronavirus-frequently-asked-questions
39. https://www.moh.gov.sa/en/Ministry/MediaCenter/Publications/Pages/covid19.aspx
40. American Dental Hygienists Association. ADHA COVID-19 Updates for Dental Hygienists. 2021.
41. Centers for Medicare and Medicaid Services. CMS Adult Elective Surgery and Procedures Recommendations. 2020.
42. Yang F, Yu L, Qin D, et al. Online consultation and emergency management in pediatric dentistry during theCOVID-19 epidemic in Wuhan: A retrospective study. Int J Paediatr Dent 2020; 31:5-11.
43. BaniHani A, Gardener C, Raggio DP, et al. Could COVID-19 change the way we manage cariesin primary teeth? Current implications on paediatric dentistry. Int J Paediatr Dent 2020; 30:523-525.
44. Cagetti MG, Angelino E. Could SARS-CoV-2 burst the use of Non-Invasive and Minimally Invasive treatments in pediatricdentistry? Int J Paediatr Dent 2021; 31:27-30.
45. Tedesco TK, Calvo AF, Lenzi TL, et al. ART is an alternative for restoring occlusoproximal cavities in primary teeth-evidence from an updated systematic review and meta-analysis. Int J Paediatr Dent 2017; 27:201–209.
46. Frencken JE, Leal SC, Navarro MF. Twenty-five-year Atraumatic Restorative Treatment (ART) approach: A comprehensive overview. Clin Oral Investig 2012; 16:1337-46.
47. Saber AM, El-Housseiny AA, Alamoudi NM. Atraumatic restorative treatment and interim therapeutic restoration: A review of literature. Dent J 2019; 7:28–38.
48. Carvalho TS, Ribeiro TR, Bönecker M, et al. The atraumatic restorative treatment approach: an "atraumatic" alternative. Med Oral Patol Oral Cir Bucal 2009; 1:668–673.
49. de Amorim RG, Frencken JE, Raggio DP, et al. Survival percentages of atraumatic restorative treatment (ART) restorations and sealants in posterior teeth: An updated systematic review and meta-analysis. Clin Oral Investig 2018; 22:2703-725.
50. Frencken JE, Pilot T, Songpaisan Y, et al. Atraumatic restorative treatment (ART): Rationale, technique, and development. J Public Health Dent 1996; 56:135-40.
51. Domejean S, Ducamp R, Léger S, et al. Resin infiltration of non-cavitated caries lesions: a systematic review. Med Princ Pract 2015; 24:216-21.
52. Ahovuo-Saloranta A, Forss H, Walsh T, et al. Pit and fissure sealants for preventing dental decay in permanent teeth. Cochrane Database Syst Rev 2017; 7:CD001830.
53. Maltz M, Henz SL, De Oliveira EF, et al. Conventional caries removal and sealed caries in permanent teeth: A microbiological evaluation. J Dent. 2012; 40:776-82.
54. Manual R. Use of silver diamine fluoride for dental caries management in children and adolescents, including those with special health care needs. Pediatr Dent 2018; 40:152–61.
55. Gao SS, Zhao IS, Hiraishi N, et al. Clinical trials of silver diamine fluoride in arresting caries among children: A systematic review. Clin Transl Res 2016; 1:201–10.
56. Crystal YO, Janal MN, Hamilton DS, et al. Parental perceptions and acceptance of silver diamine fluoride staining. J Am Dent Assoc 2017; 148:510-18.
57. Maragakis GM, Hahn P, Hellwig E. Chemomechanical caries removal: A comprehensive review of the literature. Int Dent J 2001; 51:291-99.
58. Altoukhi DH, El-Housseiny AA. Hall technique for carious primary molars: A review of the literature. Dent J 2020; 8:1–10.
59. Hussein I, Al Halabi M, Kowash M, et al. Use of the hall technique by specialist paediatric dentists: a global perspective. Br Dent J 2020; 228:33-38.
60. Jayaraman J, Dhar V, Moorani Z, et al. Impact of COVID-19 on pediatric dental practice in the United States. Pediatr Dent 2020; 42:180-183.
61. Achmad H, Djais AI, Syahrir S, et al. Impact of COVID-19 in pediatric dentistry: aliterature review. Int J Phys Res 2020; 12:830-840.
62. Shah S. COVID-19 and pediatric dentistry- traversing the challenges. A narrative review. Ann Med Surg. 2020; 58:22-33.
63. Acharya S, Singh B, Godhi B,et al. How to deal and learn from the threat of COVID-19 in pediatric dentistry. Eur J Paediatr Dent 2020; 21:173-175.

64. Bahramian H, Gharib B, Baghalian A. COVID-19 considerations in pediatric dentistry. JDR Clin Trans Res 2020; 5:307-311.