

PARENTAL ATTITUDES TO DENTAL CARE IN COVID-19
HAS COVID-19 ENCOURAGED PARENTS TO ACCEPT A MORE CONSERVATIVE
APPROACH TO DENTAL TREATMENT?

A Thesis

by

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ABSTRACT

Purpose: The purpose of this study was to assess parental knowledge of COVID-19 and attitudes to dental treatment in the current COVID-19 climate. To assess whether the COVID-19 pandemic has the potential to prompt parents to consider how the application of procedures, such as SDF and techniques such as the HT and ART, fit into the quality-of-care spectrum, given that such therapies are non-aerosol generating. Also, to assess whether history of COVID-19 infection and comprehension of AGPs is associated with parental preference to more conservative caries management options.

Methods: Parents/guardians of children, attending four pediatric dental offices in the DFW area, were invited to participate in a paper-based questionnaire to assess parental knowledge of COVID-19, attitude to oral health, practices surrounding attending the dentist during the COVID-19 pandemic and treatment preferences.

Results: A total of 118 questionnaires were completed. Thirty-three percent (n=39) of parents reported a history of COVID-19. Eighty-eight percent (n=104) agreed that they follow CDC recommendations to reduce the spread of COVID-19. Seventy-six percent (n=90) reported they had not heard of the term AGP. A conventional filling was ranked as the preferred treatment options by parents (n=63). Extraction was ranked as the least preferred treatment option (n=51). These preferences remained consistent irrespective of personal history of COVID-19 and reported understanding of the term AGP.

Conclusions: Knowledge of COVID-19 infection and necessary precautions among participants in this study was high. Knowledge of AGPs was low and was not factored into treatment decisions of the majority of parents. A conventional filling was the preferred treatment option of

parents/guardians and extraction the least preferred treatment option. There was no association between COVID-19 and treatment preferences.

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Contributors

This work was supervised by a thesis committee consisting of Dr. Carolyn Ann Kerins (chair) and Dr. Alton G. McWhorter (co-chair) of the Department of Pediatric Dentistry and Dr. Peggy Timothé (committee member) of the Department of Public Health Sciences.

The data was collected from four dental practices in the Dallas Fort Worth area.

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NOMENCLATURE

AAPD	American Academy of Pediatric Dentistry
ADA	American Dental Association
AGP	Aerosol Generating Procedure
ART	Atraumatic Restorative Treatment
CDC	Centers for Disease Control and Prevention
DFW	Dallas Fort Worth
ECC	Early Childhood caries
GDP	General Dental Practitioner
GA	General Anesthesia
HCWs	Healthcare Workers
HSAR	High speed air rotator
HT	The Hall Technique
PPE	Personal Protective Equipment
MID	Minimal Intervention Dentistry
MERS	Middle East respiratory syndrome coronavirus
OHRQoL	Oral Health-Related Quality of Life
RCT	Randomized clinical trial
SARS	Severe Acute Respiratory Syndrome
SDF	Silver Diamine Fluoride
SMART	Silver Modified Atraumatic Restorative Treatment
SSC	Stainless Steel Crown
USS	Ultra-Sonic Scaler
WHO	World Health Organization

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1 INTRODUCTION

The impetus for this study arose from an exploration into how the COVID-19 pandemic has affected dentistry. This study investigated whether associations exist between COVID-19 and treatment decisions. Further, the study seeks to assess whether this pandemic has the potential to prompt parents to consider how the application of procedures, such as silver diamine fluoride (SDF), alternative definitive restorative techniques such as atraumatic restorative treatment (ART) and the Hall technique (HT) fit into the quality-of-care spectrum, given that such therapies are non-aerosol generating. Section 2 comprehensively outlines the literature search strategy used, and the existing literature on the broad areas under study. Insight is provided into the challenges dentistry is facing during the COVID-19 pandemic, the unique risk posed by Aerosol Generating Procedures (AGPs) and the paradigm shift in caries management from a conventional approach to a more biological approach. To appreciate and understand these multifaceted concepts within the context of this research, a brief overview of the main concepts is provided.

On March 11th 2020, the World Health Organization declared COVID-19 a global pandemic.¹ COVID-19 is the disease caused by the SARS-CoV-2 virus which emerged in late 2019. The global spread of COVID-19 has led to restrictions on gatherings, slowed down economies, as it infected more than 172 million patients including the global pediatric population.²⁻⁵ Since the arrival of COVID-19, interruptions to normal healthcare services have been widespread. The delivery of care within the dental service is no exception.⁶⁻⁸

Many considerations regarding possible hazardous activities or workplaces have been raised based on experience from previous SARS-CoV infections, Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), and with the knowledge of the transmission pattern of SARS-CoV-2.^{9,10} According to A New York Times article, dentistry is

considered one of the most high-risk professions in relation to COVID-19 due to close contact with patients and use of Aerosol Generating Procedures (AGPs).¹¹ The term AGPs refers to procedures considered to produce aerosols. Aerosols are considered to be small droplets of respirable size, $\leq 5 \mu\text{m}$.¹²⁻¹⁴ These aerosols can remain airborne for extended periods and can be inhaled.⁶ Dentistry may also be considered a high-risk profession, as dentists work in close proximity to patients' faces for prolonged periods, completing procedures that involve face-to-face communication and frequent exposure to saliva, blood, and other body fluids.^{10,15,16} In addition, there may be even higher risks for pediatric dentists due to the challenges with managing young children and patients with additional healthcare needs. Children are more likely to cough, sneeze, cry and spit which can theoretically generate more bioaerosols when compared to dental treatment on the adult population.^{17,18} This potential transmission of the virus through dental procedures has attracted much attention leading to suspension of routine dental care for a period of time early in the pandemic.

Oral health care is a medical necessity and with essential precautions must continue during the COVID-19 pandemic.^{19,20} Even in these unprecedented times effective prevention and caries management remains a high priority.¹⁶ Prior to the COVID-19 pandemic the increase of caries prevalence in younger children demonstrated the need for simple but effective caries management protocols.²¹ This demand for treatment, and growing disease burden is only accentuated by the shutdown of dental clinics in the early stages of the COVID-19 pandemic,²² particularly in the socio-economically disadvantaged groups of populations where the disease has a higher degree of prevalence and severity.²³⁻²⁵ The current pandemic has forced dentists to look at their practices in pediatric dentistry and consider their treatment approaches today, and also in the post-COVID-19 world.²⁶ It is essential that oral health is prioritized and emphasized.^{16,27}

There is a growing interest in alternative approaches to the management of childhood caries. The conventional approach which involves the total removal of carious tooth structure followed by placement of a restoration, is being challenged by a more conservative option.²⁸ This biological, minimally invasive, approach considers the etiology of dental caries. These alternative treatment options include sealing non-cavitated caries, using fluoride varnish and resin infiltration to arrest non-cavitated caries, atraumatic or alternative restorative treatment (ART), interim therapeutic restorations (ITR) indirect pulp capping (IPC), the Hall technique (HT); and the use of Silver Diamine Fluoride (SDF).²⁸⁻³¹ Given the high proportion of children with dental caries worldwide and the negative impact caries has on their quality of life,^{32,33} the use of these evidence-based biological approaches for caries management, in both primary and permanent dentition should be considered.¹⁷

Aerosol-generating procedures are at the core of the current challenge for dental services; interventions that avoid or minimize aerosol generation should be the interventions of choice.^{17,15,34-36} AGPs will always have a place in dentistry and when carried out with adequate precautions and PPE can be considered safe and a necessity;³⁷ However, attempts to reduce the need and number of these higher risk dental procedures should be considered. An improved focus on prevention, from primary and when necessary secondary and tertiary prevention, may help alleviate the challenges faced in this pandemic with the potential to reduce the need for advanced and emergency care.²⁶

Section 3 details the research methods undertaken for this study. In summary, a cross sectional study was designed and data collected from four dental clinics in the Dallas Fort Worth (DFW) area in the form of a parental questionnaire. Descriptive analysis was carried out to describe the sample. To explore associations between variables, a number of chi-square tests for

independence were performed. The results of the statistical analysis are detailed in Section 4. Results demonstrated COVID-19 knowledge was high among the parents sampled while knowledge of the term AGP was low. Conventional filling was the preferred treatment option by parents and no association was found between COVID-19 or knowledge of AGPs and treatment preferences.

The results of this research are discussed, critiqued and appraised within the context of previously conducted literature in Section 5. The dissertation concludes with an outline of the strengths and limitations of this research. The implications of the obtained results are delineated, with reference to implications for dentistry and caries management strategies in light of the COVID-19 pandemic. Finally, directions for future research are recommended.

2 LITERATURE REVIEW

A literature search was undertaken to examine the effect of COVID-19 on dentistry and parental attitudes to dentistry at this time to identify potential research opportunities. As the study progressed, this literature search was continuously updated. Databases including PubMed and Cochrane medical library were searched, both multidisciplinary databases. Articles were reviewed from the online search engine, Google Scholar, along with relevant articles that were in the reference list of identified articles that had not been previously retrieved. A search was also conducted of grey literature to identify relevant guidance documents from The World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), Scottish Dental Clinical Effectiveness Programme (SDCEP), the American Academy of Pediatric Dentistry (AAPD) and Cochrane oral health. The key search terms searched in the databases were: ‘COVID-19’ ‘pediatric dentistry’ ‘aerosol generating procedures’ and ‘parental acceptance’. Searches including these key terms indicated that the terms “minimally invasive dentistry”, “early childhood caries” and “non aerosol generating procedures” should be included in database searching. The Boolean search terms ‘AND’, ‘OR’, ‘NOT’ were used to allow for combinations of these search terms. Several limits were applied when searching the databases. These limits included English language, human subjects, and full-text availability.

2.1 COVID-19 and children

This novel virus presents unprecedented challenges to pediatric dentists. Children under the age of 16 make up around 13.2% of total cases in the US.³⁸ The clinical features of COVID-19 are non-specific and can resemble other respiratory infections; such as flu or pneumonia. The majority of symptomatic patients report some or all of the following; a dry cough, usually accompanied by fever difficulty in breathing, fatigue and anosmia.³⁹⁻⁴² In children, COVID-19 infection is reported

to be relatively mild in symptoms by comparison to adults and adolescents.^{4,43} Although children are less likely than older adults to become severely ill, there are subpopulations of children who may possibly be at increased risk for more significant illness.³ Younger age, underlying pulmonary pathology, and immunocompromising conditions have been associated with more severe outcomes with other coronavirus infections in children.⁴⁴ The American Academy of Pediatrics (AAP) has suggested that the number of reported COVID-19 cases in children is an underestimation due to the fact that children's symptoms are often mild.³⁸ With COVID-19 the highest viral load is observed just before symptoms appear and remains high for the subsequent five days.⁴⁵ Individuals are therefore most infectious when they are pre-symptomatic or have mild, often non-specific symptoms.⁴⁵

Although a large proportion of infected children appear to be asymptomatic, they may still contribute significantly to transmission thus posing a threat to the disease containment.^{40,46} Children are also more likely to cough, sneeze, cry and spit which can theoretically generate more bioaerosols.^{17,18} This presents a significant concern for dental care providers due to the uncertainty of a patient's infectious status. Due to gaps that still exist in our knowledge, the long incubation period of 2-14 days, and because children can be asymptomatic or present with mild, nonspecific symptoms, all pediatric patients and parents/guardians should be considered potential carriers of COVID-19 unless proven otherwise.^{41,42} The CDC recommends using additional infection prevention and control practices during the COVID-19 pandemic, along with standard practices recommended as a part of routine dental healthcare delivery to all patients.⁴⁷ These additional infection control practices include patient screening, use of tele-dentistry, universal use of personal protective equipment (PPE) including respirators, eye protection and gowns, environmental infection control as well as identifying the unique and increased risk aerosol

generating procedures pose to infection control.⁴⁷ Due to the difficulty of identifying which patients may be infected with SARS-CoV-2 infection, these practices should be applied to all patients, not just those with suspected or history of COVID-19.

2.1.1 COVID-19 Knowledge among parents

COVID-19 knowledge has been found to be high among parents in previous surveys.⁴⁸⁻⁵⁰ In a survey carried out in February 2020 assessing parent knowledge of COVID-19 it was found all parents were concerned about COVID-19.⁴⁹ COVID-19 knowledge was also found to be high in a study conducted in Turkey.⁵⁰ Ninety-six percent of parents surveyed had information about the transmission path of COVID-19.⁵⁰ One study found more than two-thirds of parents thought that the environment of the dental department was more dangerous than that of other public places.⁴⁹ While in another, 34% of the parents thought that dental clinics were more dangerous than other social areas.⁵⁰ In both studies the majority of parents reported they would attend the dental clinic if their child had a toothache.^{49,50} Eighty-one percent of parents expressed confidence in the dental department after learning that the department had employed specific COVID-19 protocols.⁴⁹ Despite 77% of parents reporting they would attend the dentist if their child had a toothache, about half of them reported they would only allow examination and extraction.⁵⁰

2.2 Recommendations and Guidelines

At the beginning of the pandemic, the suspension of elective dental care was recommended which led to the shutdown of dental clinics across the world.⁷ During this unprecedented time, the ADA Health Policy Institute launched an innovative tracking poll to monitor the economic impact of COVID-19 on dental practices. On March 23rd 2020, 17% of pediatric dental practices were closed, 81.6% were only seeing emergency patients and 1.4% remained open but with reduced volume.⁵¹ Protocols on handling emergency and urgent patients were developed to address acute dental needs

while minimizing the risk of COVID-19 transmission. These recommendations are summarized in Table 2.1^{47,52-58} Due to the rapidly changing situation, limited evidence and different phases of the pandemic across locations it is clear universal guidelines are not appropriate. Following local guidelines and utilizing professional judgement becomes essential to make decisions around whether or not to provide treatment.⁴² As time progressed and the evidence became available recommendations for reopening dental clinics were developed to assist dental clinics to navigate the challenges of the COVID-19 pandemic.^{19,59} In a survey of pediatric dentists 80% reported a return to full range of dental services by July 2020.¹⁹ Though many practices have reopened following the initial outbreak guidance continues to be reviewed and updated particularly concerning aerosol generating procedures (AGP's).

Table 2.1 Summary of recommendations

	Emergency Dental Care	Urgent Dental Care	Routine/Non-urgent Dental care	Teledentistry	Aerosol Generating Procedures
ADA March 2020 ^{53,54}	<p>Dental emergencies are potentially life threatening and require immediate treatment to stop ongoing tissue bleeding, alleviate severe pain or infection, and include:</p> <ul style="list-style-type: none"> • Uncontrolled bleeding • Cellulitis or a diffuse soft tissue bacterial infection with intra-oral or extra-oral swelling that potentially compromise the patient’s airway • Trauma involving facial bones, potentially compromising the patient’s airway 	<p>Urgent dental care focuses on the management of conditions that require immediate attention to relieve severe pain and/or risk of infection and to alleviate the burden on hospital emergency departments. These should be treated as minimally invasively as possible</p> <ul style="list-style-type: none"> • Severe dental pain from pulpal inflammation • Abscess, or localized bacterial infection resulting in localized pain and swelling • Tooth fracture resulting in pain or causing soft tissue trauma • Dental trauma with avulsion/luxation • Dental treatment required prior to critical medical procedures • Extensive dental caries or defective restorations causing pain • Manage with interim restorative techniques when possible (silver diamine fluoride, glass ionomers) 	<ul style="list-style-type: none"> • Initial or periodic oral examinations and recall visits, including routine radiographs • Routine dental cleaning and preventive therapies • Orthodontic procedures other than those to address acute issues (e.g. pain, infection, trauma) or other issues critically necessary to prevent harm to the patient • Extraction of asymptomatic teeth • Restorative dentistry including treatment of asymptomatic carious lesions • Aesthetic dental procedures 	<p>Screen for dental emergencies using teledentistry or other remote modalities, minimizing the risk of transmission</p>	<p>Reduce aerosol production as much as possible through use of hand instrumentation and employment of dental dam and high-speed suction.</p>
AAPD March 2020 ⁵²	<p>Consistent with ADA recommendations, children in need of urgent/emergency care should be treated. Urgent/emergency care means treatment of pain, swelling, trauma, and infection.</p>		<p>Elective dental care should be postponed. Hygiene and prophylaxis visits, cosmetic, and elective operative procedures should be considered non-urgent/non-emergency.</p>	<p>Institute “telephone triage” to determine if clinical visit necessary.</p>	<p>Try to minimize aerosol effects using rubber dam and high-speed suction, consider oral rinsing prior to treatment, and disinfect surfaces.</p>
CDC March 2020 ^{47,55}	<p>The urgency of a procedure is a decision based on clinical judgement and should be made on a case-by-case basis. Patient without COVID-19 symptoms: Avoid AGP whenever possible. Avoid handpieces, air–water syringe, ultrasonic. Prioritize minimally invasive/atraumatic restorative techniques (hand instruments only)</p> <p>COVID 19 suspected or confirmed patient: If emergency dental care is medically necessary, airborne Precautions (an isolation room with negative pressure)</p>		<p>If dental treatment can be delayed, provide patients with detailed home care instructions and any appropriate pharmaceuticals</p>	<p>Use teledentistry options as alternatives to in-office care.</p>	<p>During aerosol generating procedures DHCP should use an N95 respirator or a respirator that offers an equivalent or higher level of protection such as other disposable filtering facepiece respirators, powered air-purifying respirators (PAPRs), or elastomeric respirators.</p>

Table 2.1 Summary of recommendations - continued

	Emergency Dental Care	Urgent Dental Care	Routine/ Non-urgent Dental Care	Teledentistry	Aerosol Generating Procedures
RCSEng April 2020⁵⁷	<ul style="list-style-type: none"> Swelling compromising swallowing and/or breathing, extending to the eye or associated pyrexia Complex traumatic dental injuries in permanent dentition resulting in pulp exposure or severe luxation in primary dentition Uncontrolled bleeding not responded to selfcare measures Severe dental pain not responding to analgesics and impacting on eating and sleeping <p>Management: Avulsed teeth: likely prognosis, extra-oral dry time, total extra-oral time, tooth maturity, co-operation, time until extirpation can be performed, place a bracket and wire type splint to minimise AGP for removal. Use of self-etching adhesive, using a slow handpiece for splint removal, removal of composite following the pandemic Children with pulpal symptoms (excepting permanent anterior teeth), extraction Inhalational sedation as alternative to GA</p>		Routine dentistry should be deferred to minimise risk to patients, staff and the public.	Any patient requesting urgent care should first be triaged by telephone, using clinical images sent to a secure email or an online video-link by a dentist to assess the clinical urgency	AGPs present a higher risk of transmission of the virus and should therefore only be undertaken to provide urgent care where no other reasonable options available. An extraction may be the preferred treatment option for children with pulpal symptoms (excepting permanent anterior teeth) to reduce the need for AGPs.
SDCEP March 2020⁵⁶	<ul style="list-style-type: none"> Apical/periodontal abscess with spreading infection Post-extraction hemorrhage Oral ulceration in a severely dehydrated patient Inhaled tooth/tooth fragment, restoration or fractured appliance Severe bleeding that does not stop within 15–30 min 	<ul style="list-style-type: none"> Acute apical/periodontal abscess with spreading infection without airway compromise Irreversible pulpitis with severe pain Post-extraction hemorrhage that fails to stop but is not brisk or persistent Oral ulceration 3 weeks or more Avulsed permanent tooth Displaced or fractured teeth affecting the bite 	<p>Mild and moderate symptoms of the below:</p> <ul style="list-style-type: none"> Acute apical/periodontal abscess, necrotizing ulcerative gingivitis Reversible/irreversible pulpitis Post-extraction hemorrhage Oral ulceration Uncomplicated crown fracture, Avulsed primary tooth or displaced without affecting the bite Broken restorations 	Patients should be managed by telephone triage to determine appropriate management.	AGPs are not advised. If deemed a necessity should only be completed in a designated urgent care dental setting.
WHO August 2020⁵⁸	Urgent or emergency oral health care interventions that are vital for preserving a person's oral functioning, managing severe pain or securing quality of life should be provided. Acute pain/swelling/abscess due to oral infection or fractured teeth, acute pain or bleeding due to acute periodontitis, Extensive dental caries or defective restorations causing pain		Routine non-urgent oral health care should be delayed until there has been sufficient reduction in COVID-19 transmission in the community. Non urgent care includes Oral health check-ups, dental cleanings, preventive care and aesthetic dental treatment	Patients should be given advice through remote consultation or social media channels on maintaining good oral hygiene and necessity for dental visits.	When AGP cannot be avoided, ensure assistance during procedures (four-handed dentistry), the use of high-speed suction and of a rubber dam, when possible, as well as the use of appropriate PPE – including a fit tested N95 or FFP2 respirator, or higher

2.3 Aerosol Generating Procedures

Infection control practices have traditionally classified disease transmission as occurring through ‘contact’, ‘droplet’ or ‘airborne’ routes.⁶⁰ COVID-19 has similar transmission pathways to those of other SARS-CoV infections, Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).^{45,61} SARS-CoV-2, the virus that causes the disease COVID-19, is believed to be transmitted via droplets and aerosol released from an infected person's mouth or nose as they breathe, talk, sneeze or cough.^{47,62,63} Expelling these droplet particles, composed of water and mucus, is part of the normal process while breathing talking and coughing. However, when these particles contain infectious material, including viruses, disease transmission can occur.^{64,65} These droplets may range in size from 0.01 to 1000 μm , with the particle size inversely related to the velocity of air. Large droplets are considered to be $>5 \mu\text{m}$ diameter.^{66,67} Due to gravity, these larger droplets fall to the ground quickly and settle in a reasonably short distance. As a result, droplet transmission requires close physical proximity between an infected individual and a susceptible individual.^{13,64} Small particle residues, $\leq 5 \mu\text{m}$ diameter, are considered aerosols. These aerosols have a low settling velocity, so they may remain in the air for a longer time and distribute over a wide area before they can enter the respiratory tract or contaminate surfaces.^{13,64} These smaller particles carry the greatest potential for transmitting infections.¹⁴ Transmission of COVID-19 through respiratory droplets, aerosols and fomite transmission is established in the literature.^{10,15,66,68} Due to this, dentistry can be considered a high risk profession in relation to COVID-19 due to close contact with patients and use of Aerosol Generating Procedures (AGPs).^{69–}

⁷¹ In a July 2020 a survey of Public Policy Advocates (PPA) by the AAPD, 9% reported that they had heard of a COVID-19 transmission within a dental practice.¹⁹ However, despite much research

into bio-aerosols in dental settings, evidence shows there is little directly relating to respiratory viruses.^{36,65}

The term Aerosol Generating Procedure (AGP) is most often described as, “any procedure on a patient that can induce the production of aerosols of various sizes.”¹² The WHO defines AGPS as “all clinical procedures that use spray-generating equipment such as three-way air/water spray, dental cleaning with ultrasonic scaler and polishing; periodontal treatment with ultrasonic scaler; any kind of dental preparation with high or low-speed hand-pieces; direct and indirect restoration and polishing; definitive cementation of crown or bridge; mechanical endodontic treatment; surgical tooth extraction and implant placement.”⁵⁸ AGPs have been found to generate higher concentrations of infectious respiratory aerosols than coughing, sneezing, talking, or breathing.⁷² During the peak of the pandemic, AGPs were suspended in many countries and were only provided to patients requiring urgent care as per advice by health authorities around the world.^{47,52–58} As stated above, many dental treatments are AGPs, which have been associated with the transmission of not just COVID-19 but many other acute respiratory infections.⁷³ These procedures that generate aerosols can therefore lead to transmission of a virus to personnel performing the procedures as well as to people in the vicinity. In the literature there have been reports of patients acquiring infections from inhaling infectious aerosols in a dental setting; such as pneumonia as well as an outbreak of tuberculosis at a dental clinic.^{74,75} The association of increased transmission of viruses among healthcare workers is also well documented in the literature due to the use of AGPs.^{9,73,76} During the SARS 2002-2003 epidemic, nosocomial outbreaks were reported extensively in the literature. Many frontline health care workers (HCWs) had a significantly increased risk of contracting SARS-CoV that resulted in severe illness and death.^{9,67,77–80} This associated morbidity and mortality in HCWs affected by SARS focused attention on the

recommended infection control practices in preventing airborne and droplet-spread transmission of infectious agents.⁷² In 2004 the CDC and the ADA recommended the avoidance of aerosol-producing procedures in patients with active SARS.¹⁴ And in 2014 the WHO published Guidelines entitled “Infection prevention and control of epidemic-and pandemic-prone acute respiratory infections in health care.”⁶⁰ Despite the large number of nosocomial outbreaks amongst HCW it was found that there were no documented cases of SARS transmission in a dental setting.⁸² This risk of transmission in the dental setting can be minimized by effective protocols and procedures and adequate PPE.³⁷ Studies have also shown that in HCWs wearing appropriate PPE that have been exposed to COVID-19, nosocomial transmission has not occurred^{83,84}

During dental treatment there are at least three potential sources of airborne contamination: dental instrumentation, saliva and respiratory sources, and the operator.^{14,85} Most dental procedures that use mechanical instrumentation will produce airborne particles from the site where the instrument is used.¹⁴ Commonly used dental equipment known to create aerosols and airborne contamination include ultrasonic scaler (USS), high-speed air-rotors (HSAR), air/water syringe, air polishing, and air abrasion.⁶⁵ Rubber dam and high-volume suction are considered as mitigating measures to reduce aerosols.^{12,47} In a recently published literature review the greatest levels of contamination were found with procedures utilizing HSAR and USS.¹² The operator, assistant and patient were found to be consistently contaminated, with the head and patient’s chest being the most contaminated.^{12,86} Following dental treatment, and the generation of AGPs, there are a high number of potentially contaminated surfaces such as dental chairs, handles and dental instruments, all of which are possible routes of transmission.¹⁵ Contamination levels were found to be highest in front of the patient and reduced with increasing distance from the mouth with the lowest levels behind the patient.^{12,86} Aerosol and fomite transmission of SARS-CoV-2 can occur, since the virus

can remain viable and infectious in aerosols for up to 3 hours and on surfaces up to 72 hours.⁸⁷ Suspension in human secretion aids in a virus' tendency to persist on surfaces.^{66,88} Hand contact with contaminated surfaces may then lead to viral acquisition and transfer to the eyes, nose, or mouth.⁸⁹

There is currently no universal recommendation regarding patient spacing times for AGPs. Recommendations vary from 0 to 120 min depending on air exchange per hour.^{12,37,59} Conventional caries management strategies includes the use of rotary instruments and thus significant aerosol generation.^{14,90} As aerosol-generating procedures are at the core of the current challenge for dental services, interventions that avoid aerosol generation and should be the interventions of choice.^{17,15,34-36} Strategies to reduce aerosol and therefore possible transmission of COVID-19 in pediatric dentistry include avoiding the use of rotary instruments during cavity preparation as well as other mitigating factors such as use of high volume suction and rubber dam.^{12,66} This makes the ability to assess whether a child's dental complaint can be managed with non-AGPs for caries control critical and may also be useful in preventing future emergency dental needs.^{71,91}

2.4 Dental caries

Dental caries itself is an international public health challenge, especially amongst children.²⁴ It is the most common chronic disease of childhood, more common than childhood obesity, asthma or juvenile diabetes.^{23,92} Dental caries is a global problem with untreated caries in deciduous teeth affecting 573 million children and untreated caries in permanent teeth affecting 2.5 billion people.⁹³ Dental caries exerts a negative impact on the quality of life of both the child and their family.^{22,94,95} Poor oral health also has a significant impact on the growth, as well as the cognitive development of the child in the long term.⁹⁶ Untreated caries is concentrated disproportionately

among children from the lowest family income levels, and the incidence decreases as income increases.⁹⁷ Early access to preventive oral healthcare and development of an individualized preventive program based upon a caries-risk assessment is fundamental to improving children's oral health, establishing lifelong practices and reducing costs.^{98,99} Caries management at an early stage can prevent pain and suffering as well as the unnecessary expenses of treatment.¹⁰⁰ This only becomes more important during the COVID-19 pandemic.

Effective management strategies for dental caries should be based on the understanding of the etiology of caries, while taking into account socioeconomic, behavioral, and biological factors that influence child health outcomes.²¹ Caries is not an infectious disease we aim to “cure” by removing carious tooth tissue and bacteria. Instead, the aim is to manage caries by controlling the causative factors with emphasis on biofilm alteration to arrest carious lesions.^{28,101,102} These comprehensive strategies include primary and when required secondary and tertiary prevention.^{21,100} Primary prevention involves oral hygiene instruction, dietary control and use of topical fluorides. It ideally begins prior to the initiation of disease and is the key to reducing the worldwide prevalence of caries.²¹ Secondary prevention encompasses early detection, use of glass ionomer sealants and silver diamine fluoride (SDF).¹⁰⁰ It aims to prevent the progression of caries, prior to the cavitation stage of lesions.²¹ Tertiary prevention can involve both non-invasive and invasive preventive management and relates to cavitated dentine lesions.²¹ Atraumatic Restorative Treatment (ART), Simplified and Modified Atraumatic Restorative Treatment (SMART) and the Hall Technique (HT) are examples of non-invasive tertiary prevention management strategies.^{103–105} These conservative tertiary prevention approaches are supported by the WHO.¹⁰⁰

2.4.1 Early Childhood Caries (ECC)

Treatment of ECC poses significant challenges because of the capacity for cooperation of the young child, and advanced pharmacological behavior management, such as sedation or general anesthesia (GA) are often required.^{24,106,107} The AAPD defines ECC as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of six.¹⁰⁸ Preventive measures for ECC are more cost effective than emergency room visits or restorative treatments once the disease is established.¹⁰⁹ Comprehensive care under GA is relatively expensive, for the individual and for the community, and is not without risks, including the potential for long-term adverse neurodevelopmental effects.^{110–112} While dental treatment under sedation and general anesthetic is still an essential component of pediatric dentistry, considering the possible risks, alternatives that may delay or avoid use of these should be considered.¹⁰⁶ Factors that may decrease the prevalence of dental general anesthetics include increased focus on prevention and using alternative approaches.¹¹³ Definitive restorative treatment in young children, in many cases, can be postponed by use of ITR or silver diamine fluoride treatments and when possible, minimally invasive techniques are advantageous.^{24,114–116} A recent well conducted clinical trial evaluating Oral Health Related Quality of Life (OHRQoL) of children under six who were recommended for GA for the management of dental caries found that OHRQoL improved after being managed using a minimally invasive approach while the changes among the GA group were slightly lower.¹¹⁷

A recent study found an 80% decline in the incidence of dental emergencies when SDF was used as an interim measure on children with ECC awaiting definitive treatment with the use of sedation or GA.⁹¹ A study completed during a gap in GA service due to a transfer of service between hospitals showed the consequences of long wait times for GA can be significant and

should be addressed.¹¹⁸ Dental pain was found to be the most common complaint, with 41% of subjects reporting the need for analgesia, 28.5% losing sleep and 32.9% experienced problems eating. It was found that 49.4% of patients were prescribed at least one round of antibiotics during their wait, with 19.6% requiring two or more courses.¹¹⁸ With access to GA significantly curtailed during the COVID-19 pandemic the consequences of long wait times for conventional treatment, including the increased severity of existing decay and new decay, under GA or sedation must be considered.¹⁷ Given that dental caries was considered a public health problem prior to the COVID-19 pandemic and a reduction in people attending for dental care due to fear and anxiety was seen early in the pandemic, it is speculated that the requirement for dental care may grow significantly post COVID-19.^{25,119}

2.5 Minimal Intervention Dentistry

As demonstrated above, it is well established that dental caries is best managed by prevention and these cost effective preventative approaches should be prioritized over curative care when indicated.^{21,25,27,106} With this understanding, comes the use of conservative treatment options associated with the biological approach to caries management. The concept of minimal intervention dentistry is based on the factors that affect the onset and progression of disease, it therefore integrates concepts of prevention, control and treatment.¹²⁰ The terms Minimal Intervention Dentistry (MID) and minimally invasive dentistry, although similar, should not be used interchangeably. Minimally invasive dentistry refers to the operative restorative approach and is a phase within MID.¹²⁰ The evidence base supporting the biological approach for caries management has been steadily increasing over the past number of years^{31,101,121–126} MID covers a spectrum of techniques ranging from no carious tissue removal to selective carious tissue removal.^{120,123} Atraumatic Restorative Treatment (ART), Silver Diamine Fluoride (SDF), selective

caries removal, Hall technique, resin infiltration and sealants are all examples of minimally invasive, biological approaches, to caries management.^{103–105} MID is based on three key concepts: 1. An understanding of the disease etiology and prognosis; 2. Prevention by the patient, through education and availability of means enabling him/her to take responsibility for his/her own oral healthcare, and by the dental professional, through application of preventive measures; and 3. Tissue preservation treatments for cavitated lesions through the use of minimally invasive operative interventions.^{126,127} Thus, MID is a framework that ranges from primary prevention and management of the caries disease process, to the management of carious lesions by surgical and non-surgical means and based on the control of individual caries risk.^{31,122} With removal of carious tissue, the aim is “to create conditions for a long-lasting tooth restoration complex, preserving healthy and remineralizable tissue, achieving a sufficient physical seal and maintaining pulp health.”²⁸ Systematic reviews completed support the approach of sealing dentinal caries within the tooth.^{101,128} This biological management approach is less invasive than conventional dental treatment. Conventional treatment often involves the destruction of considerable amounts of sound tooth for access to the carious lesion, particularly in interproximal sites.¹²⁹ The aims of MID is maximum conservation of the tooth with the least psychological impact on the patient.²⁸ MID provides a safe evidence-based treatment approach that is highly accepted by children.^{130,131} It is important to note that the concept of MID requires the patient to take an active role in their oral health with regular dental attendance and identification of carious lesions in a timely manner.^{31,36} The success of MID is also strongly related to the possibility of changing the child's and the parents' oral health behaviors as well as addressing individual disease risks.¹⁰⁴ Another challenge associated with MID is the resistance to change amongst dental practitioners despite knowing the advantages of these minimally invasive strategies.^{122,132}

A study conducted in 2018 compared the conventional approach and biological approach directly for treating caries in primary molars.¹³³ They found that both approaches were highly successful (over 95%) with no significant difference between the two groups regarding failures.¹³³ In previous studies it was found the biological approach outperformed the conventional approach.^{134,135} Biological approaches are highly acceptable to parents and children and have been suggested to have a positive effect on OHRQoL.^{130,131,135-138}

A unique challenge for pediatric dentists is the treating of young children, or children with additional healthcare needs. Challenges encountered include the anatomy of primary teeth, small mouths and limited cooperation coupled with limitations on cognitive and psychosocial development which can make very young children unable to cooperate in restorative treatment or even routine dental care.^{139,140} Because of this, simpler, less invasive treatments, that require shorter time have a greater probability of success.^{114,138,141} The use of this less invasive biological approach could reduce the number of young children who need advanced pharmacological management for comprehensive dental treatment because of their inability to cope with local analgesia.¹³⁰ Findings from a RCT in Australia suggest MID, specifically ART and the HT, have the potential to reduce the number of children requiring GA for their caries management, thus reducing the burden on tertiary dental services.¹⁴²

Two well conducted systematic reviews of human randomized controlled trials of varying quality suggest multiple preventive interventions as alternates to the traditional methods of restorative care.^{143,144} MID has many advantages, of significant importance during the COVID-19 pandemic is reduced aerosols and treatment completion in a shorter period of time.^{104,145} Table 2.2 shows some examples of MID techniques. Due to their ease of use and decreased expense MID techniques have been widely accepted, especially in the treatment of ECC, in more disadvantaged

socio-economic environments and with uncooperative patients.^{114,138,141} A large randomized control trial conducted in the UK assessed the cost effectiveness of three different treatment options for caries in primary teeth.¹⁴⁶ Conventional treatment with prevention, biological management with prevention, and prevention alone. From this data, information was gathered on cost effectiveness, dental anxiety, child oral health-related quality of life and treatment acceptance.^{33,147,148} With regard to treatment acceptance across the groups, children and parents found each of the three strategies for the management of dental caries in primary teeth acceptable, with trust in the dental professional playing an important role.¹⁴⁷ The difference in dental anxiety and COHRQL was found to be small and not thought to be clinically significant for the children in this trial, all of whom had dental caries present.³³ This suggests the importance of including all three strategies in a clinician's armamentarium with appropriate patient and lesion selection.³³ The use of these evidence-based biological approaches becomes all the more pertinent now during the COVID-19 pandemic as non-aerosol techniques and minimally invasive procedures are preferable whenever possible.^{17,34,59,105} It is worth noting that carious lesions in children can often be treated with a non-AGP approach as it usually is the first lesion on the tooth.³⁶ This becomes more challenging with an older population or in cases of secondary caries where removal of restorative material is necessary and it may not be possible to avoid the creation of aerosols.³⁶

Table 2.2 Minimally invasive options available for treatment in the pediatric patient

Treatment	Clinical Indications	Advantages	Disadvantages
Fluoride varnishes, rinses and gels	Non-cavitated and cavitated active caries lesions in primary and permanent teeth	No local anesthesia or rotary instruments Reduced generation of bioaerosols Patient friendly treatment even in uncooperative and patients with additional healthcare needs Effective strategies to control caries ²⁷	Possible caries progression if poor hygiene persists Dental anatomy is not restored
Silver Diamine Fluoride (SDF)	Non-cavitated and cavitated active caries lesions in primary and permanent teeth, without symptoms of irreversible pulpitis	No local anesthesia or rotary instruments Reduced generation of bioaerosols Patient friendly treatment even in uncooperative and patients with additional needs Effective strategies to control caries ¹⁴⁹	Possible caries progression if poor hygiene persists, permanent black staining of treated teeth ¹⁴³
Atraumatic restorative treatment (ART)	Cavitated active caries lesions in primary and permanent teeth, without symptoms of irreversible pulpitis	No local anesthesia or rotary instruments Reduced generation of bioaerosols Effective strategies to treat caries Use of GIC that releases fluoride Applicable in anterior and posterior primary and permanent teeth Reduced carious tissue removal, anatomy of tooth restored ¹⁰⁵ Patient friendly treatment	Low survival rates for multiple surfaces restoration ¹⁵⁰
Hall Technique (HT)	Cavitated active caries lesions in primary teeth, without symptoms of irreversible pulpitis	No local anesthesia or rotary instruments Reduced generation of oral aerosol, no caries removal required, Effective in posterior primary teeth Use of glass ionomer cement (GIC) that releases fluoride, restored anatomy of a tooth Low failure rate ¹³⁵ Patient friendly treatment, reduced chair time compared to conventional SSC ¹³⁴	Temporary altered occlusion (open bite) ¹²⁴

2.5.1 Atraumatic Restorative Treatment

Atraumatic restorative treatment (ART) is part of the therapeutic armamentarium of MID.¹²⁰ ART has been endorsed for many years as a treatment option for caries in populations with little access to traditional dental care.^{115,127,151,152} This technique was pioneered in the 1980s as described by Frencken et al.¹⁵² It has two main principles; removing carious tooth tissues using hand instruments and restoring the cavity with an adhesive material.^{127,152,153} ART was pioneered in populations without access to traditional dental care.^{154,155} The main advantages of ART are cited as being greater access to care, the use of hand instruments rather than handpieces, no need for local anesthesia, cost effectiveness and also simplified infection control.^{127,128,156,157} Hand instruments can be readily cleaned and sterilized in comparison to handpieces. Considering the increased risk of COVID-19 transmission with the use of handpieces and AGPs, the benefit of simplified infection control is of the utmost importance.

The promising results from clinical studies suggest that it can also be utilized in developed countries especially for patients with multiple carious lesions during the stabilization and motivation phase of management.¹²⁰ ART also allows for restoration of the anatomical shape of the tooth, eliminating the discomfort/pain experienced by the patient during chewing.¹⁰⁵ The use of minimally invasive approaches such as ART and hand excavation to preserve more tooth structure, is also beneficial for young children.¹⁵⁸ With regard to the patient ART has been shown to reduce dental anxiety and cause less discomfort than the traditional approach using rotary instruments.¹⁵⁹⁻¹⁶¹ In a small cross sectional study of a referred population ART was also found to be a more acceptable and effective approach to restorative treatment in patients with additional healthcare needs than the conventional restorative treatment.¹³⁸

The longevity of ART in both primary and permanent teeth has been reported extensively in the literature.^{31,114,128,162} ART has been shown to have a high success rate in single-surface cavities in primary teeth.¹⁵⁰ Studies have also shown ART restorations in single-surface cavities in deciduous posterior teeth to survive as long as comparable amalgam restorations.¹⁶³ A systematic review on survival percentages of ART restorations and sealants in posterior teeth concluded that ART sealants presented a high-caries-preventive effect.¹⁶²

Case selection of teeth to treat with ART is of the utmost importance. Multiple-surface restorations in deciduous posterior teeth have been found to have a lower survival rate than single-surface restorations.¹⁵⁰ A Cochrane systematic review conducted in 2017 found comparisons in studies comparing ART to conventional treatment that ART may increase the risk of restoration failure in the primary dentition.¹²⁸ However, the very low-quality evidence was acknowledged and further research recommended.

ART has also been demonstrated to provide an alternative approach to the management of ECC in a primary dental care setting.¹¹⁷ A Randomized Control Trial (RCT) conducted in Australia, in a primary care setting, compared ART to a control group. Children in the control group were treated with the standard treatment approach which involved the use of a local anesthetic, rotary instruments and restoration of the prepared cavity with adhesive restorations with non-pharmacological behavioral management techniques. No significant difference in restorative success was found between children treated with ART in comparison to the control group after 12 months.¹⁶⁴ Children in the control group were also referred more often for specialist care compared to those treated with ART.¹⁶⁴ A recent narrative review suggests ART is an effective evidence-based alternative to conventional fillings for carefully selected cases in the post-COVID-19 era for treating and preventing carious lesions in posterior teeth.¹⁰⁵

The AAPD devised a policy associated with the Interim Therapeutic Restorations (ITR), which uses a similar technique to ART, although it has a different therapeutic goal.¹⁵¹ While ART is recognized as a definitive treatment, ITR is described as a provisional technique.¹⁵¹ Based on the AAPD definition, if ITR is applied using hand instruments only, and not rotary instruments, it can be considered as a “true” ART.¹²⁸ Recently, modified ART approaches have been discussed, these differ slightly from “true” ART as described by Frecken et al 1996.¹⁵³ These modified approaches can involve use of a handpiece to access the cavity, removal of some carious tissue with use of rotary instruments or using alternative restorative materials.¹²⁸ The use of a handpiece has been suggested to make the procedure quicker.¹⁵⁶ However, it has been suggested that these modified techniques should not be referred to as ART as it may lead to miscommunication and misunderstanding.¹²⁷ More recently a silver modified atraumatic restorative treatment (SMART) has also been described. This approach incorporates the use of SDF beneath the definite restoration.¹⁶⁵

2.5.2 Hall technique

Preformed Stainless Steel Crowns (SSCs) have long been reported in the literature to be successful in the treatment of large carious lesions and in high caries risk populations.^{166,167} They are recommended by the AAPD for extensive caries, large lesions, or multiple-surface lesions¹⁶⁸ and the British Society for Pediatric Dentistry as the treatment of choice for primary molar teeth with caries involving two or more surfaces.¹⁶⁹ The Hall Technique (HT) is a method involving the use of these preformed stainless-steel crowns to manage carious primary molar teeth. It was first published in the literature in 2006. It is a technique developed by a general dental practitioner (GDP) in Scotland in the late 1980s.¹²⁴ It is considered a biological management option for carious lesions in primary molars. Although initially controversial, the growing understanding of the

carious process has led to the widespread acceptance of the HT to manage carious lesions in primary teeth.^{134,170,171} For practitioners it is a simplified approach, no local anesthesia is required, the tooth is not prepared and no carious tissue is removed, instead the HT relies on obtaining a good seal over the carious lesion.¹²⁴ By sealing the lesion it is deprived of its main substrate, dietary carbohydrate, making the environment unfavorable for lesion progression. This allows the pulp time to lay down reparative dentine, with the goal being lesion arrest before it advances enough to cause irreversible inflammation of the pulp.^{124,135,166,171} A crown placed using the Hall Technique allows a good seal to be achieved, with a high degree of predictability.¹³⁴

Many studies have compared the success rate of HT crown over multi-surface restorations with regard to pupal health and longevity.^{125,134,166} More recently, the success of HT crowns has been evaluated alongside conventionally placed SSCs.¹⁷⁰ This trial showed no significant difference between the conventional SSC and HT groups.¹⁷⁰ A retrospective study has also shown a similar success rate for HT crowns to that of the conventional SSC.¹⁷² Studies have also shown that not only is the success rate of HT crowns high but also the time taken to place is significantly reduced when compared with conventional crowns.^{134,166,170} Children treated with the HT were found to present less negative behavior compared to those treated with conventional restoration.¹²⁵ The Hall Technique was also preferred to conventional restorations by the majority of children, parents and GDPs.^{134,136,137,173} In a study conducted in New Zealand, 90% of children treated with HT responded positively to the question whether they “enjoyed their visit to the dental clinic”.¹³⁷

2.5.3 Silver Diamine Fluoride

Silver diamine fluoride (SDF) is a colorless solution, available at a concentration of 38%, containing 44,800ppm fluoride. It was approved by the US Food and Drug Administration in 2014

as a treatment for dentinal sensitivity and is used off label for caries management.¹⁷⁴ It has been proven to be effective for caries arrest and prevention, particularly for the treatment of caries in the pediatric population.^{144,175-177} The most notable aspects of SDF is its effectiveness in arresting dental caries, it requires no caries removal, it is easy to use, is inexpensive and carries minimal risk.^{143,178} SDF requires direct contact with dentine, teeth should be free of plaque, but no caries excavation is necessary.¹¹⁶ This makes SDF a noninvasive treatment that does not require any surgical procedures, unlike other conventional caries management strategies. It must be noted however that SDF is not indicated for very large lesions encroaching the pulp or any tooth that has clinical symptoms of pulpal inflammation.¹⁷⁹ It has been widely reported in the literature for use in communities with access to care issues and is also indicated for high risk patients in traditional dental care settings.^{149,180-182} In a 2016 survey of pediatric dentistry program directors, more than 90% of the survey respondents believed that SDF would be useful in treating patients who experience difficulty undergoing conventional restorative treatment.¹⁸³

SDF has been shown to prevent emergency visits in children with ECC.⁹¹ In this study it was used as an interim treatment on children awaiting definitive treatment with sedation or general anesthesia. Seventeen-point six percent of children who had been on the waiting list prior to the introduction of SDF experienced a dental emergency versus 4.1% of children who received SDF applications while on the waiting list. This was an 80% decline in the incidence of dental emergencies after adopting SDF in the Pediatric Dental Center compared with the period immediately preceding its adoption.⁹¹

The black staining of the exposed dentine, however, may limit its acceptability in certain populations, and is the perceived barrier to parental acceptance by graduate program directors.^{149,183} A number of studies were designed to assess parental perceptions of SDF staining

and to determine the factors that may affect parental acceptance.¹⁸⁴⁻¹⁸⁶ The level of parental acceptance was found to vary depending on the tooth's location, with increased parental acceptance of posterior teeth over anterior teeth.¹⁸⁴⁻¹⁸⁶ Parents' level of acceptance was found to be greater for primary teeth than permanent teeth.¹⁸⁵ The level of parental acceptance was found to increase according to the level of difficulty that the child would experience in order to receive treatment. Crystal et al found a significant increase at the point where advanced pharmacological behavior management such as sedation or general anesthesia would be required.¹⁸⁶ Similar results were found by Bagher et al in 2019.¹⁸⁵ Parents of children with a history of uncooperative behavior during previous dental treatment were significantly more accepting of SDF treatment compared to parents of cooperative children regardless of the type and location of the teeth.¹⁸⁵

Following SDF application traditional or non-traditional restorative approaches such as the ART and Hall crowns may be performed as dictated by the response of the patient, disease progression, and the nature of individual lesions.^{165,180} SDF was found to have no effect on composite bonding and in one study increased bond strength to GIC was observed and so it's use does not preclude restoration post application if deemed suitable.^{187,188}

2.6 Parental acceptance

Many factors come in to play with regard to parental attitudes and treatment preferences. Behavioral and social factors, such as dental attendance, parents' perceptions of their children's level of dental anxiety and the socio-economic status of the family may also influence parental attitudes to dental care.¹⁸⁹ In a study conducted in Jordan, parental knowledge and acceptance of dental treatment was assessed.¹⁹⁰ In this study knowledge and acceptance of treatment options for carious primary teeth was found to be low. Fifty-five percent of parents did not feel carious primary teeth required intervention as they would be exfoliated.¹⁹⁰ Parental knowledge around treatment

options was also found to be low. Knowledge of SSCs was found to be low (11.4%) and resulted in low acceptance by parents.¹⁹⁰ The most frequently accepted restorative option was composite filling (42.2%). The assumption of dental practitioners is that a parent's priority is esthetics with regard to restorative materials.¹⁹¹ Tooth colored restorations are preferred by parents over amalgam or stainless steel crowns.¹⁹¹

As detailed above, the key factors affecting parental acceptance of SDF were tooth location and child cooperation.^{185,186,192} The results of Crystal et al, suggest that parents are willing to compromise on esthetics in favor of a using a less invasive approach, especially in cases in which the child's cooperation limits conventional treatment.¹⁸⁶ Also, it was found many parents prefer a more conservative approach if it is available to them, even at the expense of compromising esthetics.¹⁸⁶

2.7 Return to practice

Restrictions are easing and a return to "normal" dental practice is demonstrated by the ADA tracking poll.⁵¹ As of March 15th 2021 only 2.8% of practices remained closed, 59.4% were open with reduced volume while 37.7% of practices reported they were open and business as usual.⁵¹ In the state of Texas the number of practices opening were higher than the national average with only 0.6% of practices remaining closed, 48.5% reporting reduced volume and 50.8% reporting a return to usual business. While this is promising and positive, the effects of the COVID-19 pandemic may linger and may lead to a modification of some approaches in our practice of pediatric dentistry utilizing more prevention-centered practices and minimally invasive techniques in caries management.

2.8 Research question

Is there a relationship between knowledge of, or experiences of COVID-19 or knowledge of AGPs and parental attitude to dental care, specifically their preference to treatment options?

2.9 Research aim

The primary aim of this study is to assess parental knowledge of COVID-19 and attitudes to dental treatment in the current COVID-19 climate. The study seeks to assess whether the COVID-19 pandemic has the potential to prompt parents to consider how the application of procedures, such as silver diamine fluoride (SDF) and techniques such as the HT and ART, fit into the quality-of-care spectrum, given that such therapies are non-aerosol generating. A secondary aim is to assess whether COVID-19 knowledge, history of COVID-19 infection and comprehension of AGPs is associated with parental preference to more conservative caries management options.

2.10 Statement of Objectives

- To establish the knowledge of parents/guardians of COVID-19.
- To establish the knowledge and the attitude of parents/guardians to oral health and dental care.
- To establish the knowledge with respect to aerosol generating procedures (AGPs) in dentistry.
- To rank the preferences of parents/guardians with respect to treatment options including AGP and non-AGPs.
- To determine if an association exists between experience of COVID-19 and treatment option preferences.
- To determine if an association exists between understanding of the term AGP and treatment option preferences.

2.11 Hypothesis to be tested

H_0 = There is no association between COVID-19 and acceptance of conservative treatment options.

H_A = There is an association between COVID-19 and acceptance of conservative treatment options.

H_0 = There is no association between knowledge of the term AGP and acceptance of conservative treatment options.

H_A = There is an association between knowledge of the term AGP and acceptance of conservative treatment options.

3 METHODS

3.1 Research Design

A quantitative methodology was chosen to achieve the overall study aim. A cross sectional questionnaire assessing parental knowledge, attitudes and practices in relation to dentistry with the COVID-19 pandemic using parent reported outcome measures was designed.

3.2 Ethical approval

Application to the Institutional Review Board (IRB) at Texas A&M University was made (IRB2020-1156-CD-EXP) (Appendix A), and IRB approval was granted on 12/21/20.

3.3 Population

The target population for this survey included parents/guardians of patients attending dental practices in the Dallas Fort Worth area, Texas, US. A large proportion of parents/guardians would have Spanish as their first language.

3.3.1 Inclusion criteria

To be included, parents must have a child attending a pediatric dental office, speak English or Spanish, and agree to participate in the survey. Questionnaires were distributed to parents of patients based on the aforementioned inclusion criteria. A mixture of private pay patients and Medicaid patients were selected to ensure a diverse cross section of patients.

3.3.2 Exclusion criteria

Dental attenders were excluded if they were not a parent/guardian of a child or if they declined to participate.

3.4 Location of the study

The questionnaires were distributed to private practices in the Dallas Fort Worth (DFW) area. Practices were identified through contacting The Greater Dallas Pediatric Dentistry Society.

3.5 Sample size

This type of study had not been carried out before, a power analysis to determine sample size was not conducted. It was determined that for meaningful results we would require four dental practices with a mix of Medicaid and private insurance to participate and to collect at least 100 questionnaires.

3.6 Procedure

3.6.1 Designing the questionnaire

The Total Design Method (TDM) as popularized by D.A. Dillman was used to design the questionnaire to maximize return rate.¹⁹³ A paper-based questionnaire was designed to ensure accessibility to parents and maximize response rate. Limitations such as recall bias and social desirability bias were acknowledged with respect to self-complete questionnaires and steps were taken to minimise these in questionnaire development and design.¹⁹⁴

3.6.2 Informed consent

An informed consent document was attached as the first page of the questionnaire packet. (See Appendix B) This document provided the parent/guardian with information about the research. Participants were made aware of the voluntary nature of participation, and their right to withdraw from the survey at any time, without consequence. By completing and submitting the questionnaire, the parent/guardian provided their informed consent.

3.6.3 Questionnaire

The questionnaire packet supplied to dental offices consisted of three pages. The questionnaire itself consisted of one page front and back (See Appendix C). The questions in the survey were designed to reflect an 8th grade (age 13-14 years) reading and comprehension level. A total of 34 questions were included in the questionnaire. The questionnaire included Likert-style and multiple-choice questions. Clinical photographs were utilized to encourage engagement and aid with clarity. These clinical photographs were included in a “Term Explanation Sheet” where a brief description of different aerosol generating and non-aerosol generating procedures was also included. (See Appendix D) The questionnaire was divided into five sections. The first section related to the parent’s understanding of COVID-19. Questions pertaining to the child’s caries experience as well as parental attitude to oral health were asked in the second section. In the third section parents were asked about their attitudes to attending the dental clinic during the COVID-19 pandemic. The fourth section asked parents to use the term explanation sheet with clinical photographs to answer some case-based scenario questions. Finally, the fifth section asks about some parental demographics including age, gender and education level.

3.6.4 Spanish translation

Spanish is the first language of many in the Dallas Fort Worth area. To maximize response, the study documents, comprising of informed consent, questionnaire and “Term Explanation Sheet” were translated from English to Spanish and back translated from Spanish to English to ensure both questionnaires were identical. Translations were completed by a certified Texas A&M staff member (see Appendix E). The questionnaires were then tested for clarity, timing and ease of completion by bilingual dental assistants. The Spanish questionnaire packets were assembled in

the same way as the English packets, and consisted of three pages. (See Appendix F) Both Spanish and English packets were provided to all of the participating offices.

3.6.5 Incentive to complete the questionnaire

Parents were invited to complete the questionnaire when they attended with their child for a dental appointment. The estimate of time taken to complete the questionnaire was 10 minutes. To thank and acknowledge participation the option to supply an email address for a gift card raffle was included with the questionnaire packet. At all of the clinics at which participants were recruited the same script was followed.

3.7 Data collection and measures

The questionnaires were distributed to participating dental offices in the DFW area. To maximize infection control procedures, completed surveys were placed in a plastic container, which was kept sealed for 24 hours post collection of the questionnaires. Twenty-four hours was chosen as the time frame due to the potential viability of the COVID-19 virus on paper and cardboard based surfaces.⁸⁷ No pens were shared between participants and all were suitably decontaminated after use.

3.8 Variables

3.8.1 Demographic variables

Demographic information was collected in the final section of the questionnaire (Section 5). Demographic information collected for each respondent included gender, age, level of education and whether their child had additional healthcare needs. Demographic variables were banded into suitable categories.

For the purpose of this study, education level was defined based on the following categories; less than high school, graduate of high school, vocation/trade/technical school, college, Bachelor's degree, advanced degree (including masters or doctorate) (Section 5: Q1, Q2, Q3). Participants were asked whether their child had additional needs. (Section 5: Q4 and Q5) They were asked to check a box to indicate additional needs. They then had the option to indicate specific diagnosis or needs with free text.

3.8.2 Knowledge of COVID-19

Participants were asked questions to determine their knowledge of COVID-19. Questions related to transmission, treatment and practices to minimise the risk of transmission. (Section 1: Q1, Q2, Q3) Participants were also asked about their compliance with current CDC guidelines regarding hand washing, social distancing and use of face masks. (Section 1: Q4-Q7) Respondents were also asked whether they themselves or a member of their household had COVID-19. (Section 1: Q8 and Q9)

3.8.3 Dental attendance

Participants were asked about their dental attendance. They were asked whether they bring their child for regular 6 monthly visits and also rationale for bringing their child to the dentist. (Section 2: Q1 and Q2)

3.8.4 Caries experience

Respondents were asked about the past caries experience of their child. (Section 2: Q3)

3.8.5 Dental attitude and behavior

Participants were asked about their attitude to oral health and the importance of maintaining good oral health to them. (Section 2: Q4) They were also asked about the behavior regarding oral health.

They were asked about their oral health practices regarding toothbrushing and dietary choices. (Section 2: Q5 and Q6)

3.8.6 Dental attendance in the COVID-19 pandemic

A number of questions regarding attending and receiving dental treatment during the COVID-19 pandemic were asked. Participants were asked about their concern level regarding going to the dental clinic versus attending the grocery store. (Section 3: Q1 and Q2) Participants were also asked about the ease of making a dental appointment during the COVID-19 pandemic. (Section: 3 Q3) Respondents were asked about measures that would improve their comfort level when attending the dentist. They were asked about temperature checking and COVID-19 testing of staff and patients. (Section 3: Q7- Q9) In a scenario-based question respondents were asked about their course of action if their child was to complain of pain during the COVID-19 pandemic. They were also asked about their course of action if they heard a staff member of the dental clinic or their own household member had tested positive for COVID-19. (Section 4: Q2-4)

3.8.7 Understanding of Aerosol generating procedures (AGPs)

Participants were asked about their knowledge of AGPs (Section 3: Q4) and whether the risk of disease transmission with AGPs factored into treatment decisions (Section 3: Q5) Participants were also asked about their willingness to accept non-AGPs if it meant dental treatment could be completed in a more timely manner. (Section 4: Q5)

3.8.8 Treatment decisions

Participants were asked about factors that may influence their treatment decisions, such as use of AGPs and esthetics (Section 3: Q5 and Q6) Participants were also asked about treatment options for a carious primary tooth. They were given the opportunity to rank the following treatment

options in order of preference: ART, conventional filling, extraction, SDF, conventional SSC and Hall technique SSC. (Section 4: Q1)

3.9 Data management

Data from the questionnaires were entered into Microsoft Excel (Version 2105). A database of variables for data analysis was prepared in SPSS (Version 27, IBM Corp), along with a Data Dictionary. Responses were coded 1 to 6, depending on the number of options available. Individuals had the opportunity to enter free text variables when required. All information collected was entered.

All of the data was stored on an encrypted thumb drive. The only personal information collected was an optional email address. Data was deidentified prior to data analysis.

3.10 Statistical analysis

The data was imported from Microsoft Excel (Version 2105). IBM SPSS Statistics (Version 27, IBM Corp) was used for all of the statistical analysis. Descriptive analysis was carried out to describe the sample. Knowledge, habits, practices and preferences were analyzed. Possible associations were explored using chi-square tests for independence. The significance level was set at $p < 0.05$. Differences in means were compared using Student t-tests. Means, medians and proportions were reported.

4 RESULTS

This section details the results of the study. The demographic information, results of the questionnaire and statistical analysis are reported below.

4.1 Descriptive data

4.1.1 Demographic information

The questionnaire was completed by 118 parents from four dental practices in the DFW area. The demographic information is summarized in Table 4.1. Thirty-three percent (n=39) of respondents reported they themselves had COVID-19, while 50% (n=59) reported a family member has a history of COVID-19. With regard to caries experience 58% (n=69) of parents reported a history of caries in their child, while 42% (n=49) reported no caries experience.

4.1.2 Knowledge of COVID-19

Eighty-eight percent (n=104) of respondents agreed that they follow CDC recommendations to reduce the spread of COVID-19. Respondents' knowledge of COVID-19 and practices are summarized in Table 4.2.

In the scenario-based questions when asked about their course of action if a household member tested positive for COVID-19 prior to their child's dental appointment 74% (n=87) of respondents reported they would disclose this to the dental office prior to attending.

4.1.3 Parental attitude to oral health

The responses regarding parental attitudes to oral health are summarized in Table 4.3. Eighty four percent (n=99) of parents "strongly agreed" maintaining good oral health was important to them, with a further 14% (n=16) reporting to "agree". This was supported by 90% (n=96) of respondents

reporting they bring their child for regular dental exams, with only 9% (n=11) reporting they only attend at times of pain.

Virtually identical proportions either agreed or disagreed that they brushed their child's teeth more frequently during the pandemic (Table 4.3).

Table 4.1 Demographic data

The total (n) and percentage (%) by gender, age, educational attainment of parents, if a child had additional healthcare needs and the language in which the questionnaire was completed

Total (n)	Gender		Age			Education Level		Additional Healthcare Needs		Dental Clinic		Language									
	(n)	%	years	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%								
118	Male	22	19	< 30	27	23	Less than High School	10	8	Yes	7	6	Clinic 1	28	24	English	97	82			
				30-39	67	57	Graduated High School	35	30				Clinic 2	11	9						
				40-49	19	16	Vocational/Trade/Technical school	9	8				Clinic 3	44	37				Spanish	21	18
				50-59	5	4	College	33	28				Clinic 4	35	30						
				≥ 60	0	0	Bachelor's degree	20	17				No	111	94						
				Unanswered	1	1	Advanced degree	9	8												
				Unanswered	2	2															

40

Table 4.2 Questionnaire responses with respect to knowledge of COVID-19

Knowledge and Behavior Regarding COVID-19

COVID-19 is a virus which can be transmitted by coughing and sneezing	COVID-19 infection can be transmitted from a person who has no symptoms	COVID-19 can be prevented by the use of antibiotics.	I wear a face covering/mask in public places.	I wash or sanitize my hands regularly.	I practice social distancing.						
Yes	114	Yes	106	Yes	13	Yes	112	Yes	118	Yes	107
No	1	No	4	No	91	No	6	No	0	No	11
I don't know	3	I don't know	8	I don't know	14						

Table 4.3 Parental attitudes to oral health

	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%
n = 118										
I bring my child to the dentist for regular checkups every 6 months.	4	3.4	1	0.8	8	6.8	21	17.8	84	71.2
I only bring my child to the dentist when they complain of pain.	97	82.2	9	7.6	1	0.8	1	0.8	10	8.5
Maintaining good dental health is important to me	0	0.0	0	0.0	3	2.5	16	13.6	99	83.9
I brush my child's teeth more now to reduce the risk of my child requiring dental treatment in the COVID-19 pandemic	36	30.5	18	15.3	25	21.2	16	13.6	23	19.5
I try to choose healthier snacks to reduce the risk of my child requiring dental treatment in the COVID-19 pandemic	18	15.3	13	11.0	40	33.9	20	16.9	27	22.9

4.1.4 Attitude to dental attendance during COVID-19

Seventy-two percent (n=85) of parents reported it was easy to make a dental appointment during the COVID-19 pandemic. Respondents also reported a high comfort level with attending their dentist during the COVID-19 pandemic. Fifty-five percent (n=65) reported they “strongly disagree” with the statements “I worry more about going to the dentist than going to the grocery store” and 55% (n=65) “strongly disagree” with taking more precautions prior to going to the dentist. (Table 4.4) Regarding measures to make parents feel more comfortable temperature checking of all staff and patients was reported as “strongly agree” most often (38%, n=45) followed by COVID-19 testing for staff (28%, n=33) and COVID-19 testing for patients (15%, n=18).

Parents reported comfort with attending the dentist during the pandemic. When asked about their course of action if their child was to complain of dental pain, 53% (n=63) reported they would

attend their dentist, 28.81% (n=34) said they would seek dental advice over the phone and 17% (n=20) said they would wait and see.

To the question regarding a COVID-19 diagnosis of a dental staff member 49% (n=58) reported they would attend the dentist as planned, assuming all precautions had been taken. Thirty-seven percent (n=44) reported they would call the dental office and inquire as to the precautions in place. Finally, 8% (n=10) would change dental office based on this information and only 5% (n=6) reported they are not concerned with COVID-19.

Table 4.4 Attitude and anxiety surrounding attending the dentist during COVID-19

	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%
n = 118										
I worry more about going to the dentist than going to the grocery store/supermarket.	65	55.1	18	15.3	17	14.4	14	11.9	4	3.4
I take more precautions going to the dentist than going to the grocery store/supermarket.	65	55.1	19	16.1	19	16.1	13	11.0	2	1.7
I found it easy to make a dental appointment during the COVID-19 pandemic.	5	4.2	13	11.0	15	12.7	26	22.0	59	50.0
Measures to reduce anxiety:										
Temperature checking of all staff and patients	25	21.2	6	5.1	22	18.6	20	16.9	45	38.1
COVID-19 testing for all patients	35	29.7	16	13.6	35	29.7	14	11.9	18	15.3
COVID-19 testing for all staff	30	25.4	7	5.9	33	28.0	15	12.7	33	28.0

4.1.5 Understanding of AGPs

Seventy-six percent (n=90) reported they had not heard of the term AGP. Forty-seven percent (n=55) reported the risk of transmission associated with AGPs does not factor into treatment decisions and 16% (n=19) agreed their treatment decisions are affected by the possible risk of

AGPs. A large proportion, 37% (n=44) rated their decision as a three, representing a neutral response, neither agreeing or disagreeing, on the five-point Likert scale.

Regarding further restrictions and potential postponement of AGPs (as previously defined to participants) parents were asked whether they would be more likely to accept a non-AGP. The majority of parents (48%, n=59) reported they agreed they would accept a non-AGP if it meant treatment could be completed sooner. Fifteen percent of parents (n=18) reported they would not accept a non-AGP, even if it meant it would expedite treatment. A neutral response was reported by 36% (n=43) indicating neither agree or disagree.

Table 4.5 Participant responses (n) and (%) to questions on AGPs and dental activities

n = 118	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%
If dental treatment is required, my decision on which treatment option to proceed with is influenced by the risk associated with AGPs.	41	34.7	14	11.9	44	37.3	14	11.9	5	4.2
The only thing that influences my treatment decision is how the tooth will look at the end	33	28.0	17	14.4	40	33.9	22	18.6	6	5.1
If further restrictions meant AGPs had to be postponed, would you be prepared to accept a non-AGP (ART, Hall technique crown, SDF) if it meant treatment could be done sooner?	9	7.6	9	7.6	43	36.4	31	26.3	26	22.0

The treatment option preferences for a carious primary tooth are reported in Table 4.6 and demonstrated in Figure 4.1. A conventional filling was ranked as the clearly preferred treatment option by the majority of parents (n=63), followed by conventional SSC (n=11), ART (n=10), SDF (n=10), the Hall Technique (n=9) and extraction (n=5). This question was completed by 108 respondents, 10 respondents failed to complete this question.

Table 4.6 Treatment preferences of parents number (n) and percentage %

Treatment Option	Rank of Preference											
	1		2		3		4		5		6	
	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%
Conventional Filling	63	58.3	19	21.6	13	14.6	7	8.5	1	1.2	1	1.2
Conventional SSC	11	10.2	16	18.2	20	22.5	14	17.1	19	23.2	6	7.3
Total AGP	74	68.5	35	39.8	33	37.1	21	25.6	20	24.4	7	8.5
ART	10	9.3	28	31.8	19	21.3	13	15.9	13	15.9	6	7.3
SDF	10	9.3	13	14.8	18	20.2	18	22.0	17	20.7	7	8.5
HT SSC	9	8.3	4	4.5	10	11.2	28	34.1	21	25.6	11	13.4
Total Non-AGP	29	26.9	45	51.1	47	52.8	59	72.0	51	62.2	24	29.3
Extraction	5	4.6	8	9.1	9	10.1	2	2.4	11	13.4	51	62.2
Grand Total	108	100	88	100	89*	100	82	100	82	100	82	100

*Totals vary due to manner in which one survey was completed.

The least preferred treatment options (ranked number 6 most commonly) is extraction (n=51) followed by the Hall technique (n=11), SDF (n=7), conventional SSC (n=6), ART (n=6) and conventional filling (n=1). Only 82 participants completed this question in its entirety, 36 respondents did not include their sixth rank.

When the treatment options were grouped into three categories: 1. AGPs (conventional filling and conventional SSC), 2. Non AGPs (ART, SDF and HT) and 3. Extraction, the preferred treatment option was AGPs (n=74) followed by Non AGPs (n=29) and extraction (n=5) as shown in Figure 4.2.

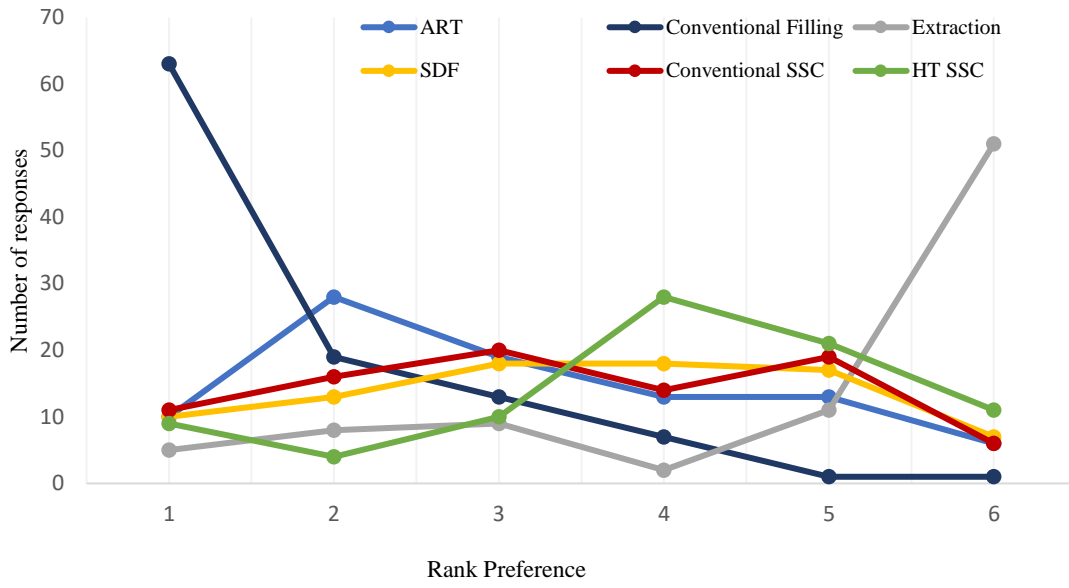


Figure 4.1 Rank preference with respect to treatment options

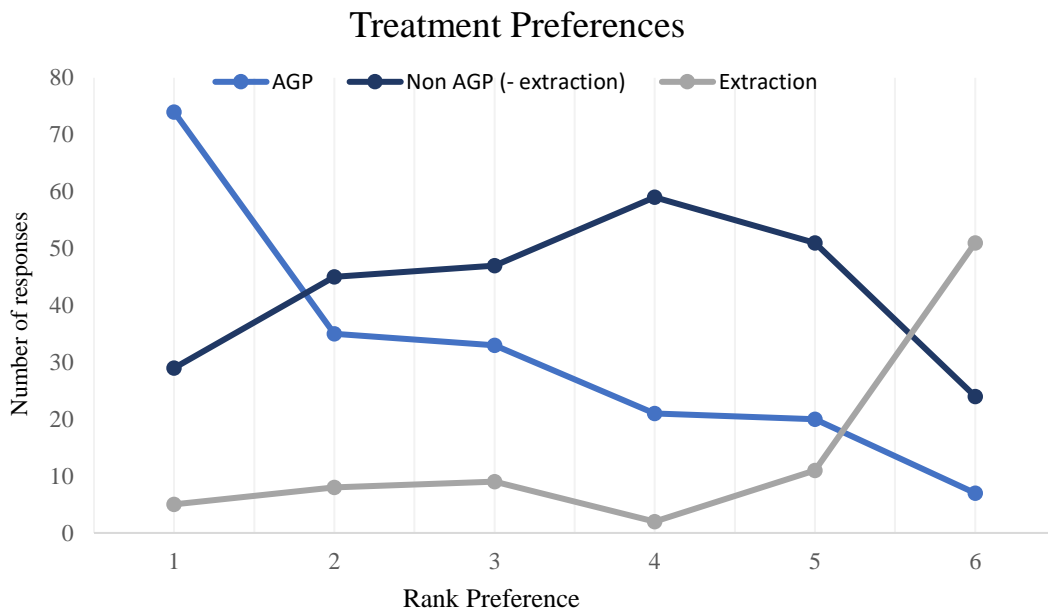


Figure 4.2 Rank preference with respect to treatment options grouped

4.2 Comparative analysis

Possible associations between personal experience of COVID-19 and worry regarding dental attendance (Table 4.7), knowledge of the term AGP and influence of risk of AGPs on treatment decisions (Table 4.8) and the influence of AGPs on treatment decisions and demographic factors (Table 4.10) were explored using chi-square tests for independence.

Cell size is small and <5 in some instances.

4.2.1 COVID-19 experience and worry regarding dental attendance

The majority of people were not worried about attending the dentist irrespective of having had COVID-19 or not, however results indicated difference between parents with a history of COVID-19 and worry towards attending the dentist and those who had not had COVID-19 ($p=0.002$). In the group who had not had COVID-19 there was a greater percentage of people worried about going to the dentist (19%, $n=15$) in comparison to the group who had previously had COVID-19 (7.7%, $n=3$) However, it was noted a large proportion (30.8%, $n=12$) of people with a history of COVID-19 infection ranked their worry as a three, indicating a neutral response to the statement. There was no difference found when history of COVID-19 in a family member was compared to worry regarding dental attendance. These results are summarized below in Table 4.7.

Table 4.7 COVID-19 experience and dental attendance

		I worry more about going to the dentist than going to the grocery store											
Experience of COVID-19		Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree		Total (n)	n = 118
		(n)	%	(n)	%	(n)	%	(n)	%	(n)	%		
I have had COVID-19	Yes	18	46.2	6	30.8	12	30.8	1	2.6	2	5.1	39	0.002 ¹
	No	47	59.5	12	6.3	5	16.5	13	16.5	2	2.5	79	
Family member has had COVID-19	Yes	31	52.5	11	18.6	11	18.6	4	6.8	2	3.4	59	ns ¹
	No	34	57.6	7	11.9	6	10.2	10	16.9	2	3.4	59	

¹Pearson chi-square; ns: not significant

4.2.2 Understanding of AGPs and influence on treatment

It was found that the majority of parents (57.1%, n=16) who reported they had heard of the term AGPs were still unlikely to factor the risk of aerosol procedures into their treatment decisions and a difference existed between those who had or not heard of AGPs and whether it influenced their treatment options (p=0.005).

Table 4.8 The understanding of the risk of AGPs and influence on treatment options

If dental treatment is required, my decision on which treatment options to proceed with is influence by the risk associated with AGPs												
I have heard the term AGPs	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree		Total	n = 118
	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	p
Yes	16	57.1	1	3.6	5	17.9	3	10.7	3	10.7	28	0.005¹
No	25	27.8	13	14.4	39	43.3	11	12.2	2	2.2	90	

¹Pearson chi-square

4.2.3 Dental clinic and understanding of AGPs

A significant difference in the reported knowledge of an AGP procedure was seen between the different clinics attended. In Dental clinic 1, participants were more likely to have heard of the term AGP (42.9%, n=12) followed by Clinic 4 (28.6%, n=10), Clinic 2 (27.3%, n=3) and Clinic 3 with just 6.8% (n=3) of parents reporting they had heard of the term AGP.

Table 4.9 Dental clinic attended and understanding of AGPs

I have heard the term Aerosol Generating Procedures (AGPs)						
Dental Clinic	Yes		No		Total	n = 118
	(n)	%	(n)	%	(n)	p
1	12	42.9	16	57.1	28	0.004¹
2	3	27.3	8	72.7	11	
3	3	6.8	41	93.2	44	
4	10	28.6	25	71.4	35	

¹Pearson chi-square

4.2.4 Demographic variables and whether AGPs affect treatment decisions

Table 4.10 presents results from analysis examining associations the influence of AGPs on treatment decisions and six demographic variables using the chi-square test of independence. Results demonstrated that no statistically significant associations existed between whether AGPs factor into treatment decisions and gender, age or education level.

Conversely, significant associations were found between whether AGPs factor into decision making and the demographic variables of language ($p < 0.05$) and dental clinic ($p < 0.05$). Dental clinic 1 demonstrated a significant majority (67.9%, $n=19$) who report they do not factor the possible risk of AGPs into treatment decisions. Dental clinic 2 showed the highest percentage of respondents (45.5%, $n=5$) factoring the possible risk of AGPs into decision making.

4.2.5 Rank preference in comparison to history of COVID-19

Parents' preferences and ranked treatment options were compared with a history of having COVID-19 as demonstrated below in Figure 4.3 and Figure 4.4. Parent's rankings were not found to be different based on a history of COVID-19 infection. Conventional filling was ranked as number one in both cases and extraction ranked as number six. There was some variation in the middle ranks. Regardless of COVID-19 history a non-AGP treatment option peaked at rank two. SDF was ranked second popular for those with a history of COVID-19, while ART was ranked second most commonly for those with no history of COVID-19 infection

Table 4.10 The influence of AGPs on treatment decisions with demographic variables

If dental treatment is required, my decision on which treatment option to proceed with is influenced by the risk associated with AGPs

Demographic Variables		Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree		n = 118	p
		(n)	%	(n)	%	(n)	%	(n)	%	(n)	%		
Gender	Male	12	29.3	3	21.4	4	9.1	2	14.3	1	20.0	ns ¹	
	Female	29	70.7	11	78.6	39	88.6	12	85.7	4	80.0		
	Undisclosed	0	0.0	0	0.0	1	2.3	0	0.0	0	0.0		
Age	< 30	8	19.5	2	14.3	14	31.8	1	7.1	2	40.0	ns ¹	
	30-39	22	53.7	7	50.0	26	59.1	9	64.3	3	60.0		
	40-49	7	17.1	4	28.6	4	9.1	4	28.6	0	0.0		
	50-59	4	9.8	1	7.1	0	0.0	0	0.0	0	0.0		
	> 60	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0		
Education Level	Less than High School	1	2.4	1	7.1	5	11.4	3	21.4	0	0.0	ns ¹	
	Graduated High School	7	17.1	5	35.7	19	43.2	3	21.4	1	20.0		
	Vocational/Trade/ Technical school	4	9.8	1	7.1	2	4.5	2	14.3	0	0.0		
	College	16	39.0	4	28.6	6	13.6	3	21.4	4	80.0		
	Bachelor's degree	10	24.4	2	14.3	6	13.6	2	14.3	0	0.0		
	Advanced degree	3	7.3	1	7.1	4	9.1	1	7.1	0	0.0		
	Undisclosed	0	0.0	0	0.0	2	4.5	0	0.0	0	0.0		
Language	English	38	92.7	10	71.4	36	81.8	8	57.1	5	100.0	<0.05	
	Spanish	3	7.3	4	28.6	8	18.2	6	42.9	0	0.0		
Dental Clinic	1	16	39.0	3	21.4	6	13.6	2	14.3	1	20.0	<0.05	
	2	2	4.9	2	14.3	2	4.5	4	28.6	1	20.0		
	3	13	31.7	9	64.3	17	38.6	5	35.7	0	0.0		
	4	10	24.4	0	0.0	19	43.2	3	21.4	3	60.0		
Additional Healthcare Needs	Yes	1	2.4	0	0.0	6	13.6	0	0.0	0	0.0	ns ¹	
	No	40	97.6	14	100	38	86.4	14	100	5	100		

¹Pearson chi-square; ns: not significant

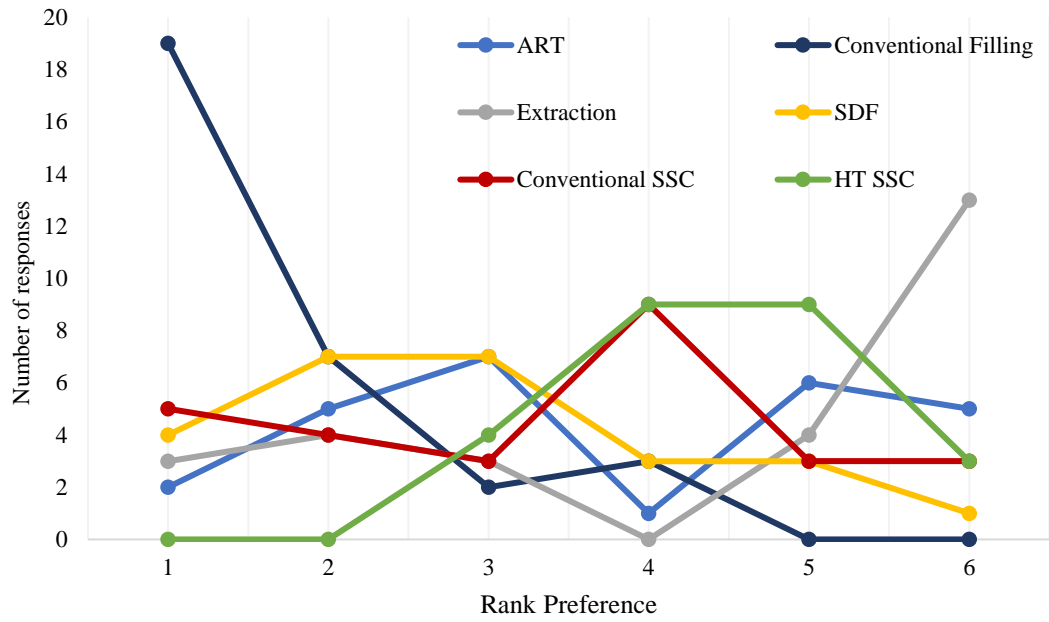


Figure 4.3 Rank preference with respect to treatment option based on a history of COVID-19

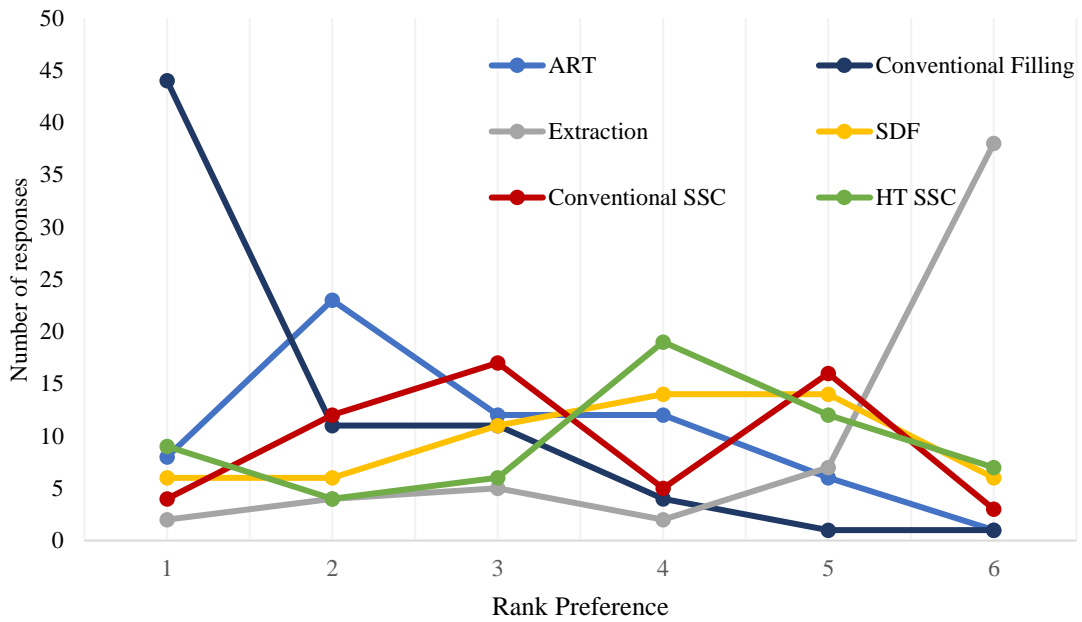


Figure 4.4 Rank preference with respect to treatment option based on no history of COVID-19

4.2.6 Rank preference with knowledge of AGPs

Preferences were also compared to the question “I have heard of the term AGP” (3.4) and reported knowledge of an AGP. There was no difference in the number one ranked option between people who reported they had heard of the term AGP and those that had not. Conventional filling was ranked as number 1 in both groups with extraction again ranked number six in both.

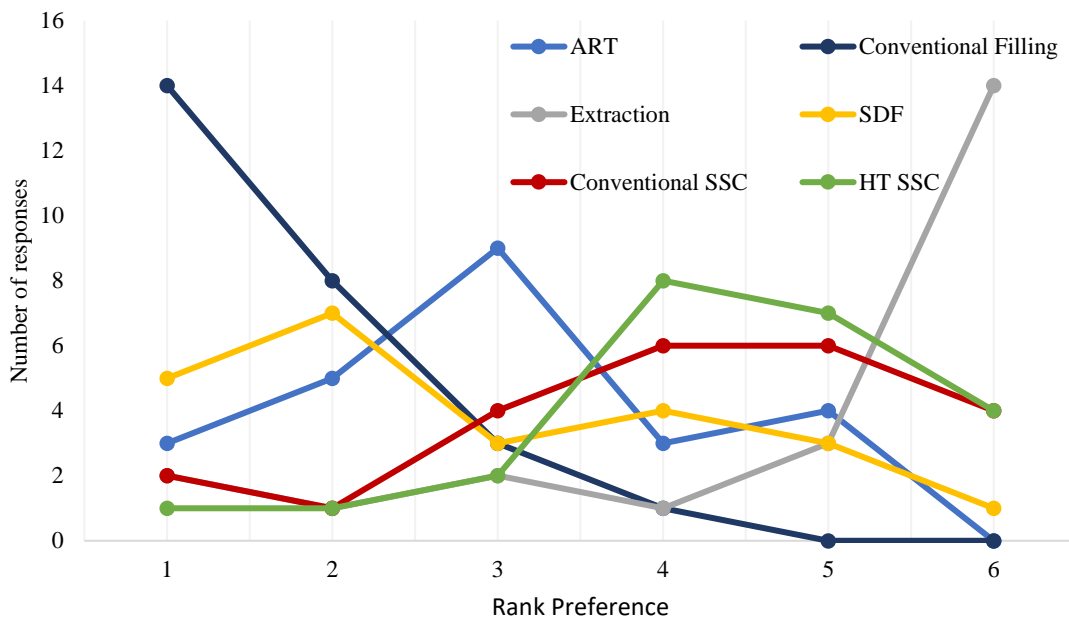


Figure 4.5 Rank preference with respect to treatment option based on knowledge of AGP

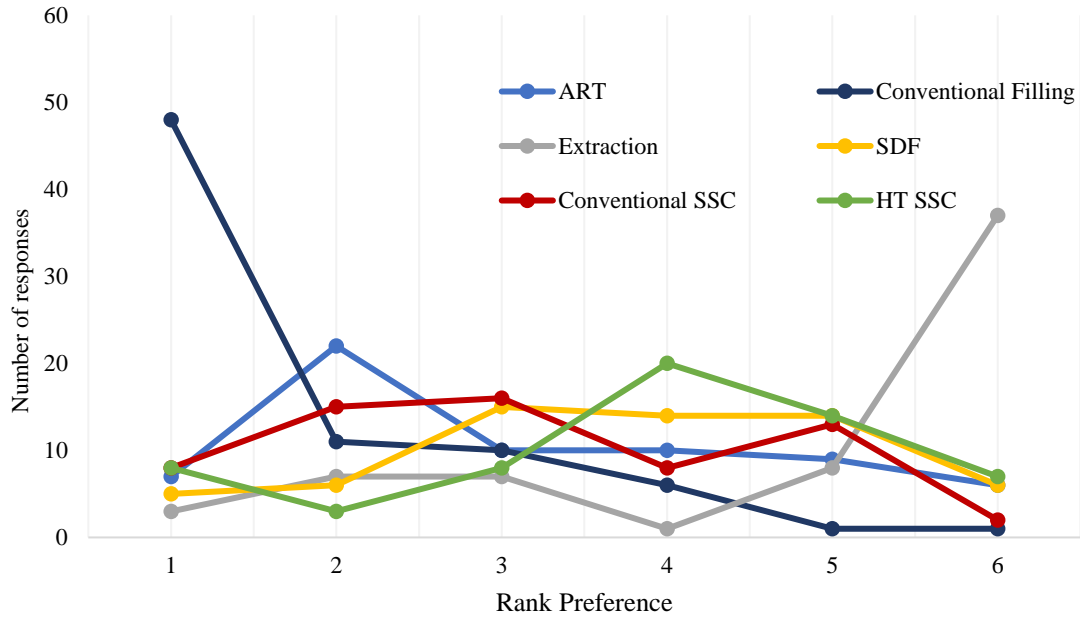


Figure 4.6 Rank preference with respect to treatment option based on no knowledge of AGP

The aim of this study was to establish the knowledge of parents/guardians of COVID-19, their attitude to oral health and dental care during the COVID-19 pandemic, assess their knowledge of AGPs and determine their treatment preferences. Furthermore, to establish whether an association exists between COVID-19 and acceptance of non-AGPs which are more conservative treatment options. The results of this study suggest possible associations between personal experience of COVID-19 and worry regarding dental attendance and also knowledge of the term AGP and influence of risk of AGPs on treatment decisions. Also, associations between the influence of AGPs on treatment decisions with dental clinic and language were observed. Results demonstrated no association between COVID-19 experience or knowledge of AGPs and acceptance of conservative treatment options, and the null hypothesis was accepted.

5 DISCUSSION AND CONCLUSIONS

In this section the results of this study are critiqued and appraised with respect to the existing literature, limitations of this study acknowledged and recommendations for future research are made. It is difficult to make any direct comparisons with previous literature due to the nature of the COVID-19 pandemic, the rapidly evolving situation and limited literature surrounding parental concerns regarding dentistry and COVID-19.

5.1 COVID-19 knowledge

A diverse group of parents in terms of age and education were successfully sampled. The knowledge of COVID-19 transmission and practices to reduce transmission was deemed to be high among respondents of the questionnaire. This is similar to previous studies assessing parental knowledge of COVID-19.⁴⁸⁻⁵⁰ Eighty-eight percent of parents sampled reported they follow CDC guidance to reduce the spread of COVID-19. Knowledge of COVID-19 transmission and compliance with measures such as hand washing and wearing a face covering was reported widely.

5.2 Parental attitude to oral health

Parents reported maintaining good dental health was important to them which was supported by their reported practices relating to attending the dentist. It is reassuring to see the parents sampled understand the importance of establishing a dental home as recommended by the AAPD.⁹⁸ Eighty-nine percent reported they seek dental care for their child at least biannually. COVID-19 does not seem to have significantly affected the respondent's oral hygiene practices regarding maintaining oral health. Forty-six percent of parents reported they do not brush their child's teeth more during the COVID-19 pandemic, and 26% reported COVID-19 had no influence on snack choices. It should be acknowledged that limitations such as recall bias and social desirability bias exist with respect to self-complete questionnaires.¹⁹⁴ This was acknowledged and steps to minimize were

taken during questionnaire design. These results indicated little to no change in oral hygiene and snacking practices, during the COVID-19 pandemic. Dental practitioners and dental associations may like to take on board these results and the possible importance of emphasizing positive oral health practices when footfall and restorative options are restricted.

5.3 Dental care during the pandemic

There is limited literature on the effect of the SARS epidemic or COVID-19 pandemic on dental attendance or worry regarding dental attendance. It is clear from the data gathered in this study that the parents sampled place a great deal of trust in their dental providers and place value in the establishment of a dental home.⁹⁸ The majority felt as comfortable attending a dental clinic as they do attending a grocery store. In two previous surveys parental feelings surrounded attending dental clinics during the COVID-19 pandemic was assessed.^{49,50} One study found more than two-thirds of parents thought that the environment of the dental department was more dangerous than that of other public places.⁴⁹ While in another 34% of the parents thought that dental clinics were more dangerous than other social areas.⁵⁰ Evidence from early on in the pandemic showed a reduced number of patients attending dental clinics.¹¹⁹ It was speculated that the anxiety associated with COVID-19 would lead to a reduction in people seeking dental care and therefore an underestimation of dental disease. It is therefore reassuring to see the high importance placed on maintaining good oral health and dental attendance amongst the parents sampled. Evidence from the SARS epidemic meant protocols for patient screening, hand hygiene, pre procedural mouth rinsing, PPE and specifically the need for respirators was established.^{60,82} These procedures were immediately adopted by dental clinics and adapted to the COVID-19 pandemic.⁵³ This quick implementation of specific protocols may have led to the comfort of parents in attending the dentist during the pandemic. This is in agreement with findings from a previous study, in which 81% of

parents expressed confidence in the dental department after learning that the department had employed specific COVID-19 protocols.⁴⁹

An interesting finding in this study was that when given the option to call the dental clinic versus attend in person only 28% reported they would call the dental clinic for advice in comparison to 53% who reported they would attend the dental clinic in the first instance. All guidance regarding dentistry during the COVID-19 pandemic recommends the use of teledentistry to screen patients and determine the clinical necessity of dental attendance.^{47,52-58} This may be influenced by the timing of questionnaire completion but may also be attributed to the trust parents place in their dental providers. The potential for bias should be noted, as the parents sampled were all attending the dental clinic to be included in this study.

The majority of respondents reported it was easy to make a dental appointment during the COVID-19 pandemic. This was reassuring to see despite the dental clinics being closed at the peak of pandemic or offering limited services.⁷ This answer may again have been influenced by the fact that the questionnaires were completed in March and April 2021, twelve months after the peak of the uncertainty and dental closures in Dallas Fort Worth. Many of these patients may also have had their dental appointment immediately prior to the dental the clinic shutdown and would not have been due a recall until after the peak of closures. A survey of pediatric dentists conducted by AAPD reported 80% had returned to provide a full range of dental services by July 2020.¹⁹

The acute phase of the pandemic has subsided and dental clinics have re-opened.⁵¹ However, many are still dealing with limitations and restrictions associated with delivery of care under GA. The consequences of long wait times are clear and include pain, infection and progression of caries.¹¹⁸ The evidence suggests that by employing these minimally invasive techniques it is possible to reduce the number of emergency visits while awaiting GA and also reduce the number

of children requiring GA.^{91,142} This becomes all the more relevant in light of the continued challenges posed by COVID-19 and recent recognition of SARS-CoV-2 as an airborne virus.^{15,66}

5.4 Understanding of AGPs

There is a significant research gap regarding the epidemiology of viral transmission from patients to health-care workers during aerosol-generating procedures in dentistry. This is compounded by ambiguity in the literature with regard to the definition of AGPs.¹² During the SARS epidemic there was an increased risk of nosocomial outbreaks attributed to the risk of AGPs, although it is important to note none of these were specifically dental procedures.^{9,79,80} The majority of parents sampled in this study had not heard of the term AGP despite the documented increased risk of disease transmission with these types of procedures.^{14,66} Only 24% of parents reported knowledge of the term AGP. The question can be raised of the necessity to inform the parent in appropriate terms of the potential increased risk of disease transmission during the informed consent process, particularly important in facilities with dental chairs in an open operator, which is common practice. Also, to inform parents of possible alternatives if clinically suitable. AGPs are integral to dentistry and should not be ceased. We know that when indicated and with adequate PPE and appropriate decontamination protocols AGPs are a necessity and can be safely completed.^{37,195} However, as emphasized in the literature anytime an alternative, less invasive procedure can be offered, it should be considered.^{17,15,34-36} This should start with informing the parent of what an AGP is. A significance difference in understanding of the term AGP between the dental clinics surveyed was observed. The difference in knowledge can be perhaps attributed to the differing populations the clinics serve.

5.5 Treatment preferences of parents

Conventional filling was consistently ranked as the preferred treatment option among the parents surveyed. This is consistent with results from a study conducted assessing parental acceptance of treatment options for carious primary teeth where a conventional filling was found to be more acceptable to parents than SSC.¹⁹⁰ The study however did not include biological approaches to caries management such as ART, SDF and HT. A conventional filling is arguably the most esthetically pleasing restoration. It's high ranking among the treatment options echoes the findings of Zimmerman et al who found the assumption of dental practitioners is that a parent's priority is esthetics.¹⁹¹ In the study conducted 24% of parents reported they agreed with the statement "The only thing that influences my treatment decision is how the tooth will look at the end" with 42% disagreeing indicating there are other factors that influence their treatment decisions.

As seen in the analysis of parental ranked treatment options, extraction was consistently ranked as the least preferred treatment regardless of history of COVID-19 infection or knowledge of the term AGP. During the early stages of the pandemic extraction was in some cases the only treatment option recommended or offered, often because of the extent of the decay coupled with the inability to offer AGPs.⁵⁷ Also, in a survey conducted in Turkey during the COVID-19 pandemic, despite 77% of parents reporting they would attend the dentist if their child had a toothache, about half of them reported they would only allow examination and extraction.⁵⁰ It is well documented in the literature that caries management at an early stage can prevent pain and suffering as well as the unnecessary expenses of treatment.¹⁰⁰ Extraction being the least preferred treatment option is consistent with the need for improved focus on primary prevention and improving oral health advocated by both the WHO and the AAPD.^{98,99} This is in contrast with the results found by Al-Batayneh et al in which extraction had a higher acceptance rate than composite

filling or SSC, although this was in a population where dental knowledge was found to be low.¹⁹⁰ While dental knowledge was not directly assessed in the current study, the importance of maintaining good oral health and dental attendance was found to be high.

During the design of this study an attempt was made to remove variables that could influence parental acceptance of treatment options and to focus on the perception of COVID-19 and AGPs exclusively. In clinical situations many more variables such as cost, safety, parents' perception of fluoride products and esthetics may also come into play. No association between experience of COVID-19 or knowledge of AGPs and treatment preferences was found.

In this study parents were not specifically asked about different treatment options based on tooth location. However, in the term explanation sheet parents were shown a picture of a carious posterior tooth and all treatment options pictured were of posterior teeth. It would be interesting to look at whether the order of treatment preferences, specifically the more minimally invasive, would remain consistent if tooth location was specified. Previous studies have shown increased parental acceptance of SDF with posterior teeth over anterior teeth.^{184–186}

5.6 Caries management approaches

With regard to various management approaches, conventional (AGP) versus MID (non-AGP), the conventional approach was ranked as the preferred treatment option by the majority of respondents. The foundation of MID and the biological approach to caries management is the idea that caries is not an infectious disease we aim to “cure” by removing carious tooth tissue and bacteria, instead, the aim is to manage caries by controlling the causative factors with emphasis on biofilm alteration to arrest carious lesions.^{28,101,102} While it was clear in this study that the non-AGP, biological approaches, were not the most preferred treatment option, neither were they the least preferred. In light of the continued challenges posed by COVID-19 and the small sample size

in this study, further research is required to understand the factors that may influence parental acceptance of minimally invasive dentistry. Results of the FICTION trial suggest both a conventional and biological approach are acceptable to patients and parents and both have a positive effect on OHRQoL.^{130,147} They are both tools that should be utilized and embraced by pediatric dentists. The results of Crystal et al suggest that with regard to SDF parents are willing to compromise on esthetics in favor of using a less invasive approach, especially in cases in which the child's age and/or cooperation limits conventional treatment.¹⁸⁶ Also, it was found many parents prefer a minimal approach if it is available to them, even at the expense of compromising esthetics.¹⁸⁶ Regardless of the approach, dental intervention, either conventional or biological, is associated with significant improvement in the child and family's oral health-related quality of life and should be prioritized.¹³⁰

5.7 Limitations and Recommendations

The limitations of this study are that it is a cross-sectional study with a small sample size. It is a sample of children attending dental clinics at a single point in time. As a result, possible associations can be discussed but not causality.

5.7.1 COVID-19 protocols and impact on response rate

COVID-19 has seen the introduction of increased infection control policies in the dental clinic which has added to the workload of dental staff. The addition of paperwork for staff to hand out in the form of the parental surveys may have affected the number of surveys administered to parents and therefore returned. Additionally, a number of offices declined to participate due to apprehension previously unconcerned patients may become concerned regarding attending the dentist during the COVID-19 pandemic. Due to the COVID-19 pandemic and protocols introduced, many of the offices no longer allowed parents to wait in a waiting room for their child.

In these cases, parents either completed the questionnaire in their vehicle or completed it while sitting in the dental operatory while their child was undergoing treatment.

5.7.2 Timing of the questionnaire

On March 10th 2021 Texas Governor, Greg Abbott, lifted the mandatory mask mandate and increased the capacity of all businesses and facilities in the state of Texas to 100%. Many of the surveys were completed in March and April 2021 and significant loosening of restrictions were observed. This may have affected people's attitude to COVID-19 and reduced concern regarding transmission. We may have obtained different insights had the questionnaire been administered earlier on in the pandemic.

5.7.3 Homogenous sample

This study was initially planned to be conducted across two populations, in DFW Texas and in Cork and Dublin, Ireland. The different phases of the pandemic across locations would have provided valuable information regarding guidelines and differing approaches to the pandemic. Also, many of the biological management approaches discussed were pioneered in Europe^{121,124} and traditionally, conservative techniques are more widely used than in the United States. From this standpoint it would be interesting to compare the different populations and evaluate the effect of COVID-19 on parental choices relating to dentistry on both. The difference between the Irish and US population would have also been interesting to explore due to the difference in delivery of care between the two. In Ireland most pediatric dentistry is delivered in a primary care setting by general dental practitioners (GDPs) in comparison to the greater access to specialist care in a primary care setting that is found in the US. Unfortunately, due to logistical issues, compounded by the effect of the COVID-19 pandemic, dental staff redeployment and extended dental clinic

closures, it was not possible to conduct the study in Ireland. This is an area for potential research, presently being considered.

5.7.4 Parents of patients with additional healthcare needs

Due to the small sample size and small number of parents of patients with additional healthcare needs (n=7) no conclusions can be drawn on the effect of additional healthcare needs on parents' feelings towards attending the dentist or their preferences for treatment. This is an area that would be included in proposed future research given the frequent need for GA, and serious effects of COVID-19.³

Minimally invasive options were already trending towards popularity and it is hypothesized that this may be accelerated by the COVID-19 pandemic, as it seems inevitable that COVID-19 will continue to challenge the capacity and capabilities of health systems. However, the challenges associated with MID should not be overlooked. The success of treatment is strongly related to the possibility of changing the child's and the parents' oral health behaviors and early detection of carious lesions.^{31,104} The resistance to MID among some practitioners^{122,132} should also be addressed.

5.8 Conclusions

1. Knowledge of COVID-19 infection and necessary precautions among parents in this study was high.
2. Knowledge of AGPs was low and was not factored into treatment decisions of the majority of parents.
3. A conventional filling was the preferred treatment option of parents/guardians and extraction the least preferred treatment option.
4. There was no association between COVID-19 and treatment preferences.

5. There was no association between knowledge of the term AGP and treatment preferences.

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APPENDIX A - ETHICAL APPROVAL

**APPROVAL OF RESEARCH
Using Expedited Procedures**
(Common Rule – Effective January 2018)

December 22, 2020

Type of Review:	Initial Review Submission Form
Title:	Parental attitudes to dental care during COVID-19. Has Covid-19 encouraged parents to accept a more conservative approach to dental treatment?
Investigator:	Carolyn Kerins, DDS, PhD
IRB ID:	IRB2020-1156-CD-EXP
Reference Number:	116391
Funding:	n/ a
Documents Approved: *copies of stamped approved documents are downloadable from iRIS	<ul style="list-style-type: none"> • IRB Application (Human Research) - (Version 1.1) • Informed Consent English (English) - (Version 2.1 Approved on 12/22/2020) • Informed Consent Spanish (Spanish) - (Version 2.1 Approved on 12/22/2020) • Term Explanation Sheet - (Version 2.1 Approved on 12/22/2020) • Term Explanation Sheet Spanish - (Version 2.1 Approved on 12/22/2020) • Survey English - (Version 2.1 Approved on 12/22/2020) - • Survey Spanish - (Version 2.1 Approved on 12/22/2020) • Certificate of Translation - (Version 1.0) - You already viewed this item
Special Determinations:	n/a
Risk Level of Study:	Not Greater than Minimal Risk under 45 CFR 46 / 21

	CFR 56
Review Category:	Category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Dear Carolyn Kerins, DDS, PhD:

The IRB approved this research on 12/22/2020.

Before 10/21/2021, you are to submit an Administrative Check-In Form to the HRPP/IRB. If the HRPP/IRB does not receive the form, there will be no approval of new research after 12/21/2021.

In conducting this research, you are reminded of the following requirements:

- You must follow the approved protocol;
- Any changes to the research must be submitted to the IRB for review and approval prior to implementation;
- Unanticipated problems or other reportable events (including protocol deviations) as described in "[HRP-029 Reportable New Information](#)" must be reported to the IRB within 5 working days of learning of the incident;
- You must notify the IRB of study completion.

Please remember that the implementation or resumption of in person participant research activities require the approval by the Vice President for Research of re-opening plans for safe operation that include infection control. <https://vpr.tamu.edu/plans-for-resumption-of-clinical-and-human-participant-research-education-and-service-activities-6-8-2020>

If you have any questions, please contact the IRB Administrative Office at 1-979-458-4067, toll free at 1-855-795-8636.

Sincerely,
IRB Administration

APPENDIX B - INFORMED CONSENT

INFORMED CONSENT SCRIPT

Title of Research Study: Parental attitudes to Dentistry in Covid-19: Has Covid-19 encouraged parents to accept a more conservative approach to dental treatment?

Investigator: Carolyn Kerins, DDS, PhD

Co- Investigator: Sorcha Harding BDS

Why am I being asked to take part in this research study?

You are invited to participate in this study because we are trying to learn more about parental attitudes to dentistry during the COVID-19 pandemic. This study hopes to look at how this risk of COVID-19 has changed the way parents think about dentistry and their child's oral health.

You were selected as a possible participant in this study because you are the parent of a child attending the dentist during the COVID-19 pandemic.

Why is this research being done?

COVID-19 has changed all our lives in so many ways. This study hopes to look at how this risk of COVID-19 has changed the way you think about dentistry and your child's oral health. This will give us a good understanding of your concerns and help us implement plans to ease them.

How long will the research last?

It will take about 15 minutes to complete the survey/questionnaire which can be returned to staff at the dental office. The survey has questions that deal with how often your child visits the dentist, how they look after their teeth and what effect COVID-19 has had on this.

What happens if I say "Yes, I want to be in this research"?

If you decide to participate, please do the following: Complete attached the survey. When you have answered all questions to the best of your ability, please return it to researcher or staff member present.

What happens if I do not want to be in this research?

Your participation in this study is voluntary. You can decide not to participate in this research and it will not be held against you. You can leave the study at any time

Is there any way being in this study could harm me?

There are no sensitive questions in this survey that should cause discomfort. However, you can skip any question you do not wish to answer or exit the survey at any point.

What happens to the information collected for the research?

All the information you give will be private and treated confidentially. All information will be kept on a password protected computer and is only accessible by the research team. No personal information will be shared with any other organization. Compliance offices at Texas A&M may be given access to the study files upon request. Your information will be kept confidential to the extent allowed by law. The results of the research study may be published but your identity will remain confidential.

What else do I need to know?

If you agree to take part in this research study, you will be entered in a raffle to win a gift card. The gift card would be sent to the email address provided at the end of the survey. This is optional if you do not want to provide your email address.

Who can I talk to?

Please feel free to ask questions regarding this study. You may contact co-investigator, Sorcha Harding, later if you have additional questions or concerns at sorcha.harding@tamu.edu.

You may also contact the Human Research Protection Program at Texas A&M University (which is a group of people who review the research to protect your rights) by phone at 1-979-458-4067, toll free at 1-855-795-8636, or by email at irb@tamu.edu for:

- additional help with any questions about the research
- voicing concerns or complaints about the research
- obtaining answers to questions about your rights as a research participant
- concerns in the event the research staff could not be reached
- the desire to talk to someone other than the research staff

Your help & cooperation is very much appreciated!

APPENDIX C - ENGLISH SURVEY

APPENDIX D - TERM EXPLANATION SHEET

Term Explanations

This is what a baby tooth with a cavity/decay usually looks like before any type of treatment



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Aerosol Generating Procedures (AGPs)		Non-Aerosol Generating Procedures (Non-AGPs)	
<p>A conventional filling is where the decay is completely removed and a filling placed on top with the use of local anesthesia (numbing). This is an aerosol generating procedure.</p>		<p>Atraumatic Restorative technique (ART) is a technique where decay is not removed, or only partially removed with a hand instrument, without the need for local anesthesia (numbing). A filling is then placed on top. This will likely need replacement in future. This is a non-aerosol generating procedure.</p>	
<p>A conventional stainless-steel crown is where the decay is completely removed, the tooth is prepared and a stainless-steel crown placed (silver cap) placed on top with the use of local anesthesia (numbing). This is an aerosol generating procedure.</p>		<p>Silver Diamine Fluoride (SDF) is a liquid which contains silver and fluoride. It can be used to help prevent cavities (or caries) from forming or growing in size. It permanently stains the cavity black. This is a non-aerosol generating procedure.</p>	
		<p>The Hall Technique is a method for managing cavities in baby teeth where the decay is not removed. It is simply sealed beneath a stainless-steel crown (silver cap) with no tooth preparation or local anesthesia (numbing). This is a non-aerosol generating procedure.</p>	

APPENDIX E - CERTIFICATE OF TRANSLATION

CERTIFICATE of TRANSLATION

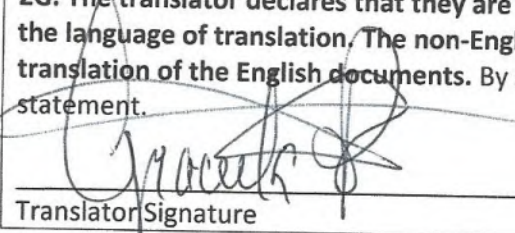
When to use this form: If you expect to enroll more than one non-English speaking subject in the United States or in a foreign country, submit this form with translated materials to indicate the qualifications of the translator. The Certificate of Translation is required to verify that the translations are accurate. Those who translate the material are to provide a brief description of their qualifications, skills or experience for serving in this role and sign the certificate of translation form.

- Please note the following:**
- For research conducted in languages other than English, the IRB requires the consent and other research material as applicable (e.g. surveys, instruments, recruitment, etc.) in both English and the language in which research is being conducted.
 - Researchers may wish to delay the initial translation until after the IRB has reviewed and approved the English versions. Doing so may help researchers avoid multiple translations.
 - If the translated versions of the documents are submitted to the IRB after initial approval of the English version, please submit an amendment along with the translated material and a copy of the certificate of translation.

Section 1. PROTOCOL INFORMATION

A. Principal Investigator:	Carolyn Kerins
B. IRB Study Number:	IRB2020-1156
C. Study Title:	Parental attitudes to Dentistry in Covid-19: Has Covid-19 encouraged parents to accept a more conservative approach to dental treatment?

Section 2. TRANSLATOR

A. Translator's Name:	Graciela Perez
B. Translator Email Address:	Gperez@tamu.edu
C. Translator's Qualifications:	have translated documents for over 25+ years
D. Language of translation:	Spanish
E. Name of Translation Service (when applicable):	N/A
2E. List of document(s) translated:	Survey, Informed Consent, Term Explanation sheet
2F. Date(s) of translation(s):	
2G. The translator declares that they are fluent in and understand the English language and the language of translation. The non-English documents for this study are a true and accurate translation of the English documents. By signing below, I, the translator, agree with this statement.	
	<u>12/2/2020</u>
Translator Signature	Date

APPENDIX F - SPANISH QUESTIONNAIRE PACKET

GUIÓN DE CONSENTIMIENTO INFORMADO

Título del estudio de investigación: Actitudes de los padres hacia la odontología durante la pandemia de Covid-19: Ha Covid-19 animado a los padres a aceptar un enfoque más conservativo en el tratamiento dental?

Investigadora: Carolyn Kerins, DDS, PhD

Co- Investigadora: Sorcha Harding, BDS

Por qué se me pide que participe en este estudio de investigación?

Está invitado a participar en este estudio porque estamos tratando de aprender más sobre las actitudes de los padres hacia la odontología durante la pandemia de COVID-19. Este estudio espera ver cómo este riesgo de COVID-19 ha cambiado la forma en que los padres piensan sobre la odontología y la salud dental de sus hijos.

Fue seleccionado como posible participante en este estudio porque usted es el padre de un niño que asistió al dentista durante la pandemia de COVID-19.

Por qué se realiza esta investigación?

COVID-19 ha cambiado todas nuestras vidas de muchas maneras. Este estudio espera ver cómo este riesgo de COVID-19 ha cambiado su forma de pensar sobre la odontología y la salud dental de su hijo. Esto nos dará una buena comprensión de sus preocupaciones y nos ayudará a implementar planes para aliviarlos.

Cuánto tiempo durará la investigación?

Le tomará alrededor de 15 minutos para completar la encuesta/cuestionario que se puede devolver al personal en el consultorio dental. La encuesta tiene preguntas que tratan sobre la frecuencia con la que su hijo visita al dentista, cómo se cuida sus dientes y qué efecto ha tenido COVID-19 en esto.

Qué sucede si digo "Sí, quiero estar en esta investigación"?

Si decide participar, por favor haga lo siguiente: Complete la encuesta adjunta. Cuando haya respondido todas las preguntas lo mejor que pueda, devuélvalas al investigador o al miembro del personal presente.

Qué pasa si no quiero estar en esta investigación?

Su participación en este estudio es voluntaria. Puede decidir no participar en esta investigación y no se tomará en su contra. Puede abandonar el estudio en cualquier momento.

Hay alguna forma de que participar en este estudio pueda perjudicarme?

No hay preguntas sensibles en esta encuesta que deban causar incomodidad. Sin embargo, puede omitir cualquier pregunta que no desee responder o salir de la encuesta en cualquier momento.

Qué sucede con la información recopilada para la investigación?

Toda la información que proporcione será privada y tratada de forma confidencial. Toda la información se guardará en una computadora protegida con contraseña y solo el equipo de investigación podrá acceder a ella. No se compartirá información personal con ninguna otra organización. Las oficinas de cumplimiento en Texas A&M pueden tener acceso a los archivos del estudio a pedido. Su información se mantendrá confidencial en la medida permitida por la ley. Los resultados del estudio de investigación pueden publicarse, pero su identidad se mantendrá confidencial.

Qué más necesito saber?

Si acepta participar en este estudio de investigación, participará en un sorteo para ganar una tarjeta de regalo. La tarjeta de regalo se enviará a la dirección de correo electrónico proporcionada al final de la encuesta. Esto es opcional si no desea proporcionar su dirección de correo electrónico.

Con quien puedo hablar?

No dude en hacer preguntas sobre este estudio. Puede comunicarse con la co-investigadora, Sorcha Harding, después si tiene preguntas o inquietudes adicionales en sorcha.harding@tamu.edu

También puede comunicarse con el Programa de Protección de Investigaciones Humanas de la Universidad de Texas A&M (que es un grupo de personas que revisan la investigación para proteger sus derechos) por teléfono al 1-979-458-4067, sin cargo al 1-855-795-8636, o por correo electrónico a irb@tamu.edu para:

- ayuda adicional con cualquier pregunta sobre la investigación
- expresar preocupaciones o quejas sobre la investigación
- obtener respuestas a preguntas sobre sus derechos como participante de una investigación
- preocupaciones en caso de que no se pudiera contactar con el personal de investigación
- el deseo de hablar con alguien que no sea el personal de investigación

Su ayuda y cooperación son muy apreciadas!

Actitudes de los padres hacia la odontología en la pandemia de Covid-19.

Lea y responda a las siguientes preguntas. Coloque una o junto a la respuesta que mejor se adapte a sus necesidades

Sección 1: En esta sección habrá algunas preguntas sobre su comprensión de COVID-19.

COVID-19 es un virus que puede transmitirse al toser y estornudar.
 Si | No | No lo sé

La infección por COVID-19 puede transmitirse de una persona que no presenta síntomas.
 Si | No | No lo sé

El COVID-19 se puede prevenir mediante el uso de antibióticos..
 Si | No | No lo sé

Actualmente sigo las recomendaciones de los CDC para reducir la propagación de COVID-19
 1 2 3 4 5
 Nunca Siempre

Uso una mascarilla o una cubierta facial en lugares públicos.
 Si | No

Me lavo o desinfecto las manos con regularidad.
 Si | No

Practico el distanciamiento social.
 Si | No

He tenido COVID-19
 Si | No

Un miembro de mi familia ha tenido COVID-19.
 Si | No

Sección 2: Gracias por ayudarnos con las preguntas hasta ahora. Ahora me gustaría hacerle algunas preguntas sobre su hijo.

Llevo a mi hijo al dentista para chequeos regulares cada 6 meses.
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Solo llevo a mi hijo al dentista cuando se queja de dolor.
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Mi hijo ha tenido caries en el pasado
 Si | No

Lo importante para mi es mantener buen salud dental
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Cepillo los dientes de mi hijo más ahora para reducir el riesgo de que mi hijo necesite tratamiento dental durante la pandemia de COVID-19.
 1 2 3 4 5

Totalmente en desacuerdo Totalmente de acuerdo

Intento elegir bocadillos más saludables para reducir el riesgo de que mi hijo necesite tratamiento dental durante la pandemia de COVID-19
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Sección 3: Ahora me gustaría hacerle algunas preguntas sobre sus sentimientos al ir al dentista durante la pandemia de COVID-19.

Me preocupa más ir al dentista que ir a la tienda / supermercado.
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Tomo más precauciones yendo al dentista que yendo a la tienda / supermercado
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Me resultó fácil hacer una cita con el dentista durante la pandemia de COVID-19.
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

He escuchado el término "procedimientos de generación de aerosoles" (AGP)
 Si | No

Los procedimientos generadores de aerosoles (AGP) son procedimientos que generan altas concentraciones de aerosoles respiratorios infecciosos. Más alto que toser, estornudar, hablar o respirar. Ejemplos de AGP incluyen empastes, limpiezas y coronas que requieren el uso de una pieza de mano dental.

Si se requiere tratamiento dental, mi decisión sobre la opción de tratamiento a seguir está influenciada por el riesgo asociado con los procedimientos de generación de aerosoles.
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Lo único que influye en mi decisión de tratamiento es cómo se verá el diente al final.
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Si no tuviera que preocuparse por ausentarse del trabajo o por el costo del tratamiento, ¿qué acciones reducirían su ansiedad / preocupación asociada con ir al dentista durante la pandemia de COVID-19?

Checando la temperatura de todo el personal y los pacientes
 1 2 3 4 5
 Totalmente en desacuerdo Totalmente de acuerdo

Prueba de COVID-19 para todos los pacientes
 1 2 3 4 5

Totalmente en desacuerdo	Totalmente de acuerdo
Prueba de COVID-19 para todos los miembros del personal.	
<input type="checkbox"/> 1	<input type="checkbox"/> 2
<input type="checkbox"/> 3	<input type="checkbox"/> 4
<input type="checkbox"/> 5	<input type="checkbox"/> 5
Totalmente en desacuerdo	Totalmente de acuerdo

Sección 4: Lea los escenarios abajo y elija la opción que más se ajuste a lo que haría. **Utilice las explicaciones y las imágenes adjuntas para ayudarle a tomar una decisión.**

Su hijo tiene una caries grande en un diente de leche y el dentista sugiere todas las siguientes como posibles opciones de tratamiento. Clasifique sus preferencias del 1 al 6, siendo 1 la opción más aceptable para usted y 6 la menos aceptable.

- Técnica de restauración atraumática (no AGP)
- Empaste convencional (AGP)
- Extracción (no AGP)
- Fluoruro de plata diamina (no AGP)
- Corona de acero inoxidable convencional (AGP)
- Corona de acero inoxidable: técnica Hall (no AGP)

Su hijo se queja de dolor en un diente. Esta es la primera vez que se queja de dolor. De las opciones abajo, ¿qué curso de acción es más probable que tome?

- Hacer cita con la dentista lo antes posible.
- Como esta es solo la primera queja de dolor, espere y vea si mejora.
- Llame a la clínica dental, tal vez pueda obtener algún consejo por teléfono.
- Es solo un diente de leche, probablemente se caerá pronto

Acaba de enterarse de que un miembro del personal de su consultorio dental dio positivo por COVID-19 hace dos semanas. Su hijo tiene una cita con el dentista la próxima semana. De las opciones abajo, ¿qué curso de acción es más probable que tome?

- Asistir a mi cita con el dentista como estaba previsto, supongo que se han tomado todas las precauciones.
- Asistir a mi cita con el dentista según lo planeado, no me preocupa COVID-19.
- Llame a la clínica dental y pregunte qué precauciones y protocolos se han implementado.
- Cambiar inmediatamente el consultorio / cita dental

Su hijo ha tenido dolor de muelas durante los últimos dos días, lo ha mantenido despierto por la noche y ahora está llorando de dolor. Otro niño en su casa dio positivo por COVID-19 hace dos días. Ambos niños no tienen síntomas actuales de COVID-19.

- Llamo al dentista para hacer una cita con el dentista. No les informo de la prueba COVID-19 positiva del otro

niño ya que el consultorio dental puede negarse a ver a mi hijo y tiene un dolor terrible.

- Llamo al dentista para hacer una cita con el dentista. Les informo que un niño en nuestro hogar ha dado positivo por COVID-19, pero ninguno tiene ningún síntoma ahora.
- Llevo a mi hijo a la sala de emergencias del hospital más cercano.
- Intento aliviar el dolor de mi hijo con analgésicos de venta libre y permanezco aislado durante 10 a 14 días.

Si más restricciones significaran que los AGP tuvieran que posponerse, ¿estaría dispuesto a aceptar un tratamiento que no es AGP (ART, corona con técnica de Hall, SDF) si eso significara que el tratamiento podría realizarse antes?

1 2 3 4 5

Totalmente en desacuerdo Totalmente de acuerdo

Sección 5: Responda las siguientes preguntas sobre usted

el genero
 Masculino | Hembra | Prefiero no revelar

Años
 ≤ 30 | 30 - 39 | 40 - 49 | 50 - 59 | ≥ 60

El nivel educativo más alto que hayas alcanzado

- Menos que escuela secundaria / escuela secundaria
- Graduado del colegio
- Escuela vocacional / comercial / técnica
- La universidad
- Licenciatura/el bachillerato
- Título avanzado (incluyendo maestría o doctorado)

Su hijo tiene necesidades especiales de atención médica?
 Si | No

Si respondió afirmativamente a la pregunta anterior, ¿ha recibido su hijo un diagnóstico específico?
 Si | No

En caso afirmativo, escriba el diagnóstico

Dirección de correo electrónico:

Su ayuda y cooperación son muy apreciadas!

Explicacion de los Términos

Así es como se ve un diente de leche con caries antes de cualquier tipo de tratamiento



Procedimientos de generación de aerosoles (AGPs)		Procedimientos que no generan aerosoles (Non-AGPs)	
<p>Un relleno convencional es donde la carie se elimina por completo y se coloca un relleno encima con el uso de anestesia local (adormecimiento). Este es un procedimiento de generación de aerosol.</p>		<p>La técnica de restauración atraumática (ART) es una técnica en la que la caries no se elimina, o solo se elimina parcialmente con un instrumento manual, sin necesidad de anestesia local (adormecimiento). Luego se coloca un relleno encima. Es probable que sea necesario reemplazarlo en el futuro. Este es un procedimiento que no genera aerosoles.</p>	
<p>Una corona de acero inoxidable convencional es donde la caries se elimina por completo, se prepara el diente y se coloca una corona de acero inoxidable (tapa plateada) encima con el uso de anestesia local (adormecimiento). Este es un procedimiento de generación de aerosol.</p>		<p>El fluoruro de plata diamina (SDF) es un líquido que contiene plata y fluoruro. Se puede usar para ayudar a prevenir la formación de caries o el crecimiento de la caries. Mancha permanentemente la caries de color negro. Este es un procedimiento que genera aerosoles.</p>	
		<p>La técnica Hall es un método para tratar las caries en los dientes de leche donde la caries no se elimina. Simplemente se sella debajo de una corona de acero inoxidable (tapa plateada) sin preparación dental ni anestesia local (adormecimiento). Este es un procedimiento que no genera aerosoles.</p>	