IMPACT OF THE COVID-19 PANDEMIC ON PEDIATRIC DENTAL CARE AND THE USE OF MINIMALLY EVASIVE PROCEDURES IN BRAZIL

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André Sobrinho de Souza[1], Anne Karoliny Silva Balbino[2], Darah Sathler Alvim Moraes[3], Gabriela Silva Miyakawa[4], Julia Fernanda Cotta de Amorim[5], Kartesiany Silva Balbino[6], Lariza Pivetta[7] and Daniela Pert el Milleri[8]

ABSTRACT

Considering the COVID-19 pandemic that generated direct impacts on the health area, pediatric dentistry was also affected, since the transmission of the virus occurs from droplets and aerosols from an infected individual. In this way, extra protocols and safety measures were put in place before and during treatment to minimize the spread of infection among dentists, patients and other health professionals. In pediatric dental care, some authors suggest the use of minimally invasive procedures (MIPs) in the management of caries lesions. Therefore, the objective of this study is to review the literature on the impact of the COVID-19 pandemic on the provision of pediatric dental care, and the use of minimally invasive procedures, as an alternative for care in dental offices. To this end, an integrative review study was carried out, in which a bibliographic survey was carried out in the *Scielo, Lilacs, Pubmed* databases from 2020 to 2024. Thus, it is observed that the COVID-19 pandemic has caused significant changes in children's diet, difficulties in accessing oral health services, and the need to change pediatric dental care protocols, several studies suggest the option for minimally invasive dental procedures, which have the advantage of reducing or eliminating the production of aerosols, with less risk of contamination for professionals, patients and guardians.

[1] Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: sobrinho.gestor@gmail.com
[2] Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: annekaroliny64@gmail.com
[3] Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: daarahalvim@gmail.com
[4] Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: gabrielamiyakawa@gmail.com
[5] Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: juliafernanda.ph@gmail.com
[6] Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: kartesiany@outlook.com
[7] Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: lariza.pivetta@gmail.com
[8] Master's degree in Dental Clinic from the Federal University of Espírito Santo.
Address: Av. Marechal Campos, 1468- Maruípe, Vitória - ES
E-mail: pertel.daniela@gmail.com

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INTRODUCTION

In December 2019, a new coronavirus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified, this virus causes Coronavirus Disease 2019 (COVID-19), originating in the city of Wuhan, China. Its transmission occurred quickly, reaching all continents, infecting and leading to the death of millions of people around the world. The transmission of the virus occurs from droplets and aerosols from an infected individual released from the mouth or nose while they speak, breathe, cough or sneeze (Nunes, 2020).

In response to the pandemic, the WHO (World Health Organization) considered the outbreak a public health emergency of international concern. Studies have shown that health professionals have a higher risk of contamination due to the nature of their work, also covering dental professionals, given that dental procedures require the dentist to be close to patients (Lobo *et al*., 2023).

Considering the need to effectively stop the spread of the virus that has high transmissibility, but with minimal damage to care, the WHO advised the review and adaptation of biosafety protocols to the pandemic scenario in all types of services, especially health services, with the intention of reducing the contamination of professionals, staff and patients (Febbo; Pinchemel, 2021).

In this sense, dental activity has been hit hard, since a significant number of surgical procedures generate aerosols, in addition, during the pandemic personal protective equipment has become scarce. Considering the need to preserve health teams and aiming to reduce the risks of contamination of patients, in several countries elective procedures in dentistry were suspended, with only urgent and emergency cases being maintained, in compliance with the dictates of various institutions worldwide and local governments (Rocha, 2020).

Oral health care systems were already dealing with problems related to access to oral health-related care, due to the social disparities surrounding this theme (Almeida *et al*, 2020). In this regard, Gonzaga and Santana (2024, p. 12) state that "social conditions are effectively the basis for the sanitary standard of a people, just as the position of each individual in society is a basis for their own health". The COVID-19 pandemic has added challenges to the area of dentistry, with the high risk of contamination of professionals due to their work, in addition, the work process developed during the pandemic focused on clinical aspects related to emergencies, without attention to the social context, in relation to living conditions and the support network (Gonzaga; Santana, 2024, p. 12).

As the pandemic grew in incidence and death numbers, it became necessary for

dentists and other oral health professionals to evaluate the issues raised and seek creative alternatives for patient education regarding self-care, as well as treatment practice options for the most vulnerable and at-risk patient population worldwide (Almeida *et al*, 2020).

Guidelines have been developed to change the paradigm of dental care to a more preventive focus; and with regard to the care of children, some publications have suggested the use of PMI's in the management of caries lesions. The main characteristic of these procedures is to reduce the production of aerosols, preserving the tooth structure that can be recovered and generating lower levels of anxiety in the pediatric patient. Despite being recommendations cited in several publications, few studies report the adherence of pediatric dentists (Braga *et al*., 2022).

In view of the reported facts, this study aims to investigate the impact of the COVID-19 pandemic on the provision of pediatric dental care in Brazil, and also the use of minimally invasive procedures as an alternative for care in dental offices.

THEORETICAL FRAMEWORK

COVID-19

Coronavirus Disease 2019 (COVID-19), an infectious disease caused by coronavirus 2 (SARS-CoV-2), with Severe Acute Respiratory Syndrome as its main complication; was declared a global pandemic by the WHO in March 2020. The virus has a remarkable potential for infectivity, since it spreads by inhaling infected particles in droplets and aerosols and through direct contact with the oral, ocular, and nasal mucous membranes (Santos *et al*., 2021).

The WHO declared the spread of COVID-19 a pandemic on March 11, 2020. In order to contain the outbreak, several countries have declared a state of emergency and implemented social distancing measures, including quarantines and lockdown periods. It is also worth highlighting the interruption of face-to-face education and confinement at home, which have produced considerable changes in the lifestyles of children and their families around the world (Almeida et al., 2020).

At first, there was a significant amount of uncertainty surrounding the disease, due to little knowledge about its etiology, route of transmission, even the occurrence of fatalities involving contagion by the virus, nor were the long-term side effects and treatment methods known. At the beginning of the pandemic, it was not evident whether the risk of infection was higher or lower for children, only later was it possible to observe that children who contracted the virus did not have symptoms, so most of these infections remained undetected (Safadi; Silva, 2020).

In Brazil, emergency measures were taken, aiming to adapt the work process of health services to the new reality imposed by the pandemic. Most health professional councils have taken a cautious approach, restricting contact activities with patients, to ensure health care. Actions based on information and communication technology were adopted. In the case of the Federal Council of Medicine – CFM, a resolution was published that allowed teleconsultations, telediagnosis, telemonitoring, teleinterconsultation, and teleguidance (Machado, 2021).

The Federal Council of Dentistry published a regulation, CFO Resolution No. 226 (CFO, 2020), at first, which expressly prohibited the practice of dentistry at a distance, mediated by technologies, for the purposes of consultation, diagnosis, prescription and preparation of a dental treatment plan. However, telemonitoring and teleguidance activities were allowed, as long as they were not carried out by call centers or any other means that centralized the receipt of demands (Nunes, 2020).

MINIMALLY INVASIVE PROCEDURES

The management of caries treatment has been a controversial subject in recent years. Recent studies reveal that less invasive approaches can be effective, such as selective tissue removal using hand-held cutting instruments; which proves the reduction of accidental pulp exposures in the treatment of deep caries lesions and atypical characteristics, but it is important to emphasize, still without proof that a certain technique can be pointed out as the "gold standard" (Nunes, 2020).

According to the Latin American Association of Pediatric Dentistry (ALOP, 2020), there are several treatment options for each type of carious lesion, as shown in Figure 1. It is worth mentioning that all exposed procedures must be performed on vital teeth, without any pulp involvement or symptoms of inflammatory pathology.

Figure 1: Flowchart according to caries lesion characteristics

Source: ALOP (2020)

It is important to note that the colors related to the severity of the lesions are also indicative of the different treatments by means of arrows; in this sense, if a treatment is marked by two or more colors, this treatment can be used in the treatment of different patterns of carious lesions (ALOP, 2020).

Minimally Invasive Dentistry (OMI) as an alternative for care in dental offices, as a measure to reduce the production of aerosols during dental procedures. In addition to the biological aspect of preserving tooth structure, PMIs make pediatric dental consultations more "peaceful", since they help reduce anxiety and improve the management of child behavior (Reis *et al*., 2020).

According to Reis *et al*. (2020) There are several minimally invasive techniques that can be used in pediatric dentistry, from the use of manual instruments, which is usually the most used technique, to others, such as the use of abrasive jets and chemical-mechanical methods. But Regardless of the type of technique, the procedure must be performed with due caution. It is noteworthy that there is insufficient evidence to recommend a specific method of caries removal for all cases. However, manual or chemomechanical cupping stands out in pediatric dentistry, as it reduces pain and discomfort during treatment.

Table 1: Minimally invasive procedures applied in pediatric dentistry and their characteristics.

Technique	Indications	Advantages	Disadvantages
Chemical removal and mechanical carious deletion	Carious lesions in deciduous and permanent teeth	Reduces use of rotating instruments, does not use local anesthesia, good acceptance, can be used with relative isolation and low cost	Increased clinic runtime
Fluoride varnishes	Prevent new carious lesions, paralyze existing lesions and remineralization	Easy application, lower risk of fluoride ingestion, greater ability to adhere to enamel surfaces and high remineralizing action	Need for prior cleaning and drying of the teeth to retain the varnish
Diamine fluoreto deprate	High risk of caries, deciduous and permanent teeth	Low cost, easy application and painless	Darkening of teeth with aesthetic impairment
Sealants	High risk and/or activity of caries, small cavitated lesions, teeth with retentive occlusal	Resin sealants: high retention rates Ionomeric sealants: increased fluoride release and greater preventive effect	Resin sealants: require greater moisture control Ionomeric sealants: lower retention
TreatmentAtraumatic Restorative	Carious lesionsdentin	Low cost, less dental destruction, minimizes pulp exposures, endodontics and tooth extractions, does not use local anesthesia	Restricted to teeth without pulp involvement, (no presence of pain, abscess, fistula, or mobility)
TechniqueHall	Deciduous molars with lesions on two or more surfaces	It makes the development of caries unfeasible, does not require preparation or use of local anesthesia, has high longevity	Difficult access in the Brazilian market, aesthetic compromise and failures at the points of contact and intercudation
Application of infiltrators	Initial lesions of non-cavitated, deciduous and permanent white spots	Strengthens and fills demineralized enamel without preparation, reduces the effects of fluorosis and the fragility of teeth with enamel defects	High-cost material and does not have sufficient resistance to prevent the recurrence of new carious lesions

Sourcee: Gomes *et al.* (2020)

In IMO, dental procedures are used to treat carious lesions in a less invasive way, seeking to maintain the maximum original tissue of the tooth. As shown in table 1, according to Gomes *et al.* (2020) there are advantages and disadvantages for each of the techniques that can be employed, in this sense it is necessary to make the patient or guardian aware of the procedure, and also about the importance of brushing to prevent the development and/or progression of dental caries.

Gomes (2020) points out that the minimally invasive approach in dentistry promotes the reduction of the potential for contamination of various pathologies, where caries repair procedures do not differ from other treatment modalities, either in the aesthetic aspect or in the quality of the treatment.

METHODOLOGY

This is an integrative review study, which was configured as a selection of relevant research in order to support better clinical practice; indicating the possible gaps in knowledge that may demonstrate the need for new studies on the theme studied (Souza; Silva; Carvalho, 2010).

The identification of descriptors for use in the search in the databases was carried out, and the combinations of the terms were made with each other, in Portuguese and English. The descriptors selected for the search were: Minimally Invasive Procedures; Covid-19; Pediatric Dentistry, Caries. The selected databases were Scielo, Lilacs, and Pubmed, in order to meet the criteria of relevance, accessibility, and comprehensiveness.

Studies published in the last 05 years, from 2020 to 2024, especially articles, which dealt with field research and literature review, case/experience studies, and other academic works, were considered as inclusion criteria. Exclusion criteria were scientific productions unrelated to the theme and repeated productions.

The study selection process, considering the combinations of descriptors in the databases, identified 251 publications. After reading the titles and abstracts, publications that did not correspond to the objectives of this review, were not directly related to the central scope of this research, inclusion criteria, or that were located in more than one database. At the end of the process, 12 publications were considered eligible for the study.

RESULTS AND DISCUSSIONS

After the eligibility of the articles, they were organized in a table (Chart 1) with information related to the authors, year of publication and title of the articles. It is important to highlight that the selected articles addressed several perspectives related to the impacts of the pandemic on pediatric dental care (Beltrame et al., 2022; Lobo *et al*., 2023) addressed the reduction of dental care, both curative and preventive, already (Braga *et al*., 2022; Gomes *et al*., 2020; Febbo; Pinchemel, 2021) paid special attention to the use of PMI's, in relation to the methodologies adopted there are literature reviews and case studies in the selection.

Table 1: List of Eligible Publications

Authors	Title
Cunha *et al* (2021)	The impact of the COVID-19 pandemic on the supply of dental procedures performed by the Unified Health System: a syndemic perspective
Beltrame *et al* (2022)	Oral health before and during the COVID-19 pandemic in primary care in the municipality of Ipatinga in Minas Gerais
Lobo *et al* (2022)	Impacts of COVID-19 on dentistry: an integrative review
Gomes *et al* (2020)	Minimally Invasive Procedures in Pediatric Dentistry
Nunes *et al* (2020)	The challenges of dental practice in times of pandemic
Lucena *et al* (2020)	Access to oral health in primary care before and after the beginning of the COVID-19 pandemic in Brazil
Ribeiro *et al* (2021)	The impact of the COVID-19 pandemic on child and adolescent dental care in the Unified Health System of João Pessoa-PB
Crescitelli (2023)	Impact of the COVID-19 pandemic on oral health-related quality of life
Santos *et al* (2021)	Food in the pandemic - how this issue affected children's oral health - narrative review of the literature
Braga *et al* (2022)	Changes in pediatric dental care and use of minimal intervention procedures during the COVID-19 pandemic
Febbo; Pinchemel (2021)	Minimally Invasive Dentistry in Times of Covid-19: Literature Review
Barbosa *et al* (2021)	Dental caries management and child behavior during the COVID-19 pandemic: case report

Source: Prepared by the Author

The Covid-19 pandemic impacted the supply of dental care by the Unified Health System (SUS) in Brazil, this finding was confirmed by Cunha *et al* (2021) in their study where it was evidenced that the number of emergency dental consultations and procedures in primary and specialized care services decreased by 42.5 and 44.1%, respectively, between 2019 and 2020. Elective procedures were impacted by 92.3%. In this research, it was possible to confirm how much the Covid-19 pandemic brought consequences for all Brazilians, with the mutual deterioration of the health and lives of individuals.

The reduction in dental care, both curative and preventive, due to COVID-19, was also described in the research developed by Beltrame *et al*. (2022) and Lobo *et al*. (2023); However, the researchers emphasized in their studies that although the pandemic resulted in a reduction in curative procedures, there was an effort to create and disseminate

campaigns aimed at the promotion, prevention, and recovery of oral health, especially in individual or collective oral hygiene guidelines.

Lobo *et al*. (2023) highlighted in their study that during the pandemic the highest priority was the protection of patients and professionals, due to the risks of transmission of the virus. Dentistry had to adapt to this scenario, in this sense it had to make significant changes in the way it operated, which required adaptation and resilience from professionals to ensure the continuity of quality dental care and the safety of patients and professionals. In addition, it is necessary to emphasize that due to the pandemic there was a movement to develop new technologies and minimally invasive techniques to prevent and treat oral diseases.

Another situation also emphasized in oral health studies in times of COVID-19 was the relationship between oral health and dietary changes in children during the pandemic, considering the need for social isolation. Santos *et al* (2021) in their study to assess this situation and found an increase in the intake of fermentable sugars, dietary sugars, and snacks in the interval between meals. Another finding of the research was that the pandemic also affected oral hygiene procedures, both in frequency, as well as in the time allocated to brushing and using toothpaste with adequate fluoride concentration.

Lucena *et al* (2020), on the other hand, in view of data from the public reports of the Health Information System for Primary Care (SISAB) of the Ministry of Health of Brazil, on oral health, found a significant reduction in care in cases of dento-alveolar abscess and toothache during the first four months of the pandemic in Brazil, compared to the pre-pandemic period; emphasizing that the numbers do not demonstrate that cases of dental urgency did not exist, but rather insinuate that this type of care was not provided by the public health sector. They also emphasize the need for actions in order to adapt health services aiming at the resumption of elective care and effective resolution of cases of dental urgency in cases of pandemic; since the generation of a repressed demand in oral health can mean an involution of the epidemiological situation in Brazil.

Nunes *et al* (2020) in their work draw attention to the existence of other infectious diseases transmitted by airways such as measles, chickenpox, rubella and tuberculosis, which have the same mode of contagion as covid-19 (coughing, sneezing, inhalation of droplets, contact with oral, nasal and ocular mucous membranes), also remembering that the risk of exposure of office professionals has always existed, despite having been underestimated or relegated to a secondary plan; highlighting that actions to control the aerosols generated in the dental environment were never seen as feasible, in view of the

possibility of reducing the number of procedures to be performed by professionals in their daily practice.

Still highlighting the biosafety issues argued vehemently during the pandemic, studies by Gomes *et al* (2020), Nunes *et al* (2020) and Ribeiro *et al* (2021) state that stricter biosafety measures had to be adopted, so dental professionals sought Personal Protective Equipment (PPE), causing the growth in sales of these products, especially N95 masks, face *shields*, disposable gowns, among others; and that such demand caused the scarcity of these materials, raising their values to unimaginable levels, impacting the operating costs of dental care.

Complementing the strands of the studies cited in this work, Crescitelli (2023) states that the quality of life and oral health of individuals had negative impacts in several aspects during the pandemic, causing damage to the oral health of the population, not only due to restrictions on dental care, but also because of the economic, food, and psychosocial impacts. On the other hand, Lobo *et al.* (2023) points out that the experiences acquired during the pandemic can represent an opportunity to improve dental practices and promote innovation and foster transformations in this sector.

Regarding dental treatment, Gomes *et al* (2020) highlight in their study that the demand for PMI's has grown, with the aim of reducing or eliminating aerosolization, in order to avoid contamination. In addition, they also mention that the health education process was addressed by several authors, highlighting the importance of professionals guiding their patients about the increase in the need and quality of adequate oral hygiene, which reduces the number of oral diseases, such as caries, periodontal diseases, and the number of procedures performed in the office.

In the study developed by Febbo; Pinchemel (2021), through a literature review, in order to guide the dental surgeon in his understanding of the strategy of minimum intervention in deciduous teeth and to address the importance of reducing risk factors in times of COVID-19, the importance of performing PMI's during the pandemic was evidenced, since it values the use of manual instruments in caries control, without the need to use rotating instruments.

Also according to the authors, the procedures that were already used in pediatric dentistry, before the pandemic, due to the difficulty in managing child patients, generating greater ease in care, since it causes a reduction in clinical work time, and generally does not require the use of rotating and anesthesia instruments, which favors the conduct of clinical care, with less risk of contamination for professionals, patients and guardians.

Barbosa *et al* (2021) conducted a clinical case study of dental caries management and child behavior in the setting of the COVID-19 pandemic. Following the dental treatment of a 7-year-old child who had caries in several teeth, and in view of the concern to provide care safely for both the team and the patient and his caregiver, the option was made to use PMI's for the management of carious lesions, and at the end of the treatment it was proven that minimally invasive techniques are an option for the management of dental caries, especially during the pandemic period.

Finally, a cross-sectional study with the participation of pediatric dentists, carried out by Braga *et al* (2022) evaluated the consequences of the COVID-19 pandemic on pediatric dental care, as well as the adoption of PMI for the management of dental caries, finding that the COVID-19 pandemic caused a reduction in the number of patients; and added to this situation, the study participants reported having one or more PMI's for the management of caries lesions in children, Among which it is worth highlighting the most frequent: application of fluoride varnish, selective removal of decayed tissue and the application of sealant; while the application of silver diamino fluoride, infiltrating resin and cementation of steel crown by means of the Hall technique were the procedures least used by the professionals.

CONCLUSION

At the end of this study, it was possible to verify that the COVID-19 pandemic caused significant changes in dental environments and that it demanded new clinical conducts, especially in pediatric dentistry. The closure of dental clinics has made it difficult to access dental services, with the significant drop in curative procedures during the pandemic. Some professionals reported that they offered PMIs during this period for the management of caries lesions in children.

Changes in the children's routine were also highlighted, with the cancellation of classes and social isolation, generating implications for their diet, possibly due to the financial difficulties experienced by families, with the increase in the consumption of processed foods and the intake of fermentable sugars. Oral hygiene was also impaired, either due to the time of brushing or even the use of toothpaste with inadequate fluoride concentration.

It is important to highlight that PMI's were already used in pediatric dentistry before the pandemic, in order to facilitate the management of child patients, with a reduction in clinical work time, and not requiring rotating instruments and anesthesia, which favors the conduct of clinical care. It was also evidenced that such procedures have the advantage of

reducing or eliminating the production of aerosols, with a lower risk of contamination by covid for professionals, patients and guardians.

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