Artículo de Revisión
https://doi.org/10.47990/alop.v13i1.561

Pediatric dentistry in the context of COVID-19: scientific publications and clinical practice

Michelle Jenné Allegretto[1], *Thamirys da Costa Rosa*[1], *Mariana Coutinho Sancas*[1], *Andréa Fonseca-Gonçalves*[1], *Laura Guimarães Primo*[1], *Andréa Vaz Braga Pintor*[1].

Abstract: The purpose is to analyze the characteristics of the studies and trends in scientific publications and the clinical recommendations related to COVID-19 in pediatric dentistry. Electronic search was performed on MEDLINE, Scopus, Web of Science Core Collection, and LILACS/VHL databases, without restrictions. Studies that used terms referring to COVID-19, pediatric dentistry, and children in the title, abstract, or keywords were included. Bibliometric data and studies' characteristics were extracted. Each study was categorized according to its design, sample, and main subject. Forty-nine studies were included, most of them reviews (n=25; 51.00%), observational studies (n=23; 47.00%), and clinical study (n=1; 2%). The main topics were dental emergencies (n=9; 18.30%), biosafety (n= 8; 16.30%) and teledentistry (n=6; 12.20%). The most reported dental emergencies were trauma (n=12; 63.10%), edema (n=9; 47.30%), and pain (n=9; 47.30%). It was concluded that few studies on COVID-19 and pediatric dentistry were conducted, and most reviews and observational studies regarding dental emergencies were published in Asia.

Key words: COVID-19, Pediatric dentistry, Child, Clinical practice, Review.

Odontopediatría en el contexto de la COVID-19: publicaciones científicas y práctica clínica

Resumen: El propósito es analizar las características de los estudios y las tendencias en las publicaciones científicas y las recomendaciones clínicas relacionadas con el COVID-19 en odontopediatría. La búsqueda electrónica se realizó en las bases de datos MEDLINE, Scopus, Web of Science Core Collection y LILACS/BVS, sin restricciones. Se incluyeron estudios que usaron términos referentes a COVID-19, odontología pediátrica y niños en el título, resumen o palabras clave. Se extrajeron datos bibliométricos y características de los estudios. Cada estudio se categorizó de acuerdo con su diseño, muestra y tema principal. Se incluyeron 49 estudios, la mayoría revisiones (n=25; 51,00%), estudios observacionales (n=23; 47,00%) y estudio clínico (n=1; 2%). Los principales temas fueron urgencias odontológicas (n=9; 18,30%), bioseguridad (n= 8; 16,30%) y teleodontología (n=6; 12,20%). Las urgencias odontológicas más reportadas fueron trauma (n=12; 63,10%), edema (n=9; 47,30%) y dolor (n=9; 47,30%). Se concluyó que se realizaron pocos estudios sobre COVID-19 y odontología pediátrica, y la mayoría de las revisiones y estudios observacionales sobre emergencias dentales se publicaron en Asia.

Palabras clave: COVID-19, Odontopediatría, Niño, Práctica clínica, Revisión.

[1] *Universidade Federal do Rio de Janeiro. Brazil.*

Odontopediatria no contexto da COVID-19: publicações científicas e prática clínica

Resumo: O objetivo é analisar as características dos estudos e tendências nas publicações científicas e recomendações clínicas relacionadas ao COVID-19 em odontopediatria. A busca eletrônica foi realizada nas bases de dados MEDLINE, Scopus, Web of Science Core Collection e LILACS/BVS, sem restrições. Foram incluídos estudos que usaram termos referentes a COVID-19, odontopediatria e crianças no título, resumo ou palavras-chave. Os dados bibliométricos e as características do estudo foram extraídos. Cada estudo foi categorizado de acordo com seu desenho, amostra e tema principal. Quarenta e nove estudos foram incluídos, sendo a maioria revisões (n=25; 51,00%), estudos observacionais (n=23; 47,00%) e estudo clínico (n=1; 2%). Os principais temas foram emergências odontológicas (n=9; 18,30%), biossegurança (n= 8; 16,30%) e teleodontologia (n=6; 12,20%). As emergências odontológicas mais relatadas foram trauma (n=12; 63,10%), edema (n=9; 47,30%) e dor (n=9; 47,30%). Concluiu-se que poucos estudos sobre COVID-19 e odontopediatria foram realizados, com a maioria das revisões e estudos observacionais sobre emergências odontológicas publicados na Ásia.

Palavras-chave: COVID-19, Odontopediatria, Criança, Prática clínica, Revisão.

Introduction

In the COVID-19 pandemic, dentists have intensified biosafety protocols and modified procedures to reduce the risk of cross-contamination in clinical environments.[1] COVID-19's main mode of transmission is exposure to respiratory fluids contaminated by the virus. Such exposure can occur through inhalation of droplets or aerosols or their deposition on mucous membranes through direct contact with splashes or indirect contact with contaminated hands.[2] The mode of transmission, the detection of the SARS-Cov-2 coronavirus in saliva,[3] and the evidence regarding the potential for generating aerosols in dental procedures, especially those performed with mechanized instruments and concomitant use of air and water,[4] boosted the search for policies to reduce the risk of contamination.[5-7]

It is known that the use of mouthwash with an antiseptic solution before dental procedures,[6] high efficiency suction,[7] and air cleaning systems[5] can contribute to reducing air contamination. Likewise, for safety, it is necessary to use personal protective equipment (PPE); rigorous management of environmental cleaning and disinfection, sterilization, and material disposal; and pre-screening patients for symptoms or diagnosis of COVID-19 or contact with infected individuals.[2]

However, in pediatric dentistry, screening for COVID-19 is difficult since most children are asymptomatic.[8] Other challenges related to the dental treatment of pediatric patients are the exclusion of toddlers and pre-schoolers from immunization programs for the disease and the scarcity of studies conducted with this population in relation to COVID-19. Therefore, the relevance of the present study, which aims to identify and analyze the characteristics of the studies, research trends, and the clinical recommendations related to COVID-19 in pediatric dentistry, through a bibliometric review, becomes evident.

Methods

Data sources and search strategy

An electronic search was performed in September 2021 on the MEDLINE (via PubMed), Scopus, Web of Science Core collection, and LILACS databases. The search strategy was idealized for the MEDLINE database, using terms-controlled vocabulary and free terms. Then, it was adapted according to the syntax rules for each database (Table 1). No language or publication restrictions were applied.

Eligibility Criteria

Original full scientific studies, review articles, case reports, clinical trials, and short communications published in pediatric dentistry that encompassed terms or keywords related to COVID-19 in the title, abstract, or keywords were considered eligible for inclusion.

Documents such as letters, news, editorials, comments, scientific blogs, perspectives, technical notes, or opinions were excluded. In addition, studies related to other coronaviruses, otherwise SARS-CoV-2, unavailable full text articles, or studies that addressed pediatric dental care outside of the COVID-19 pandemic period were also excluded.

Study selection

The records retrieved were imported into the Rayyan®[9]. Two independent

Table 1. *Search strategy according to different databases.*

Database	Search Key (September 2, 2021)
MEDLINE (http://www.ncbi.nlm.nih.gov/sites/pubmed)	(Pediatric dentistry[MeSH Terms] OR Pediatric dentistry[Title/Abstract] OR Paediatric dentistry[Title/Abstract] OR Pedodontics[Title/Abstract]) AND (Covid-19[MeSH Terms] OR Covid-19[Title/Abstract] OR Covid-19 pandemic[Title/Abstract] OR SARS-CoV-2[MeSH Terms] OR SARS-CoV-2[Title/Abstract] OR Coronavirus[Title/Abstract] OR 2019-nCoV[Title/Abstract])
Scopus (http://www.scopus.com)	(INDEXTERMS (pediatric dentistry) OR TITLE-ABS-KEY (pediatric dentistry) OR TITLE-ABS-KEY (paediatric dentistry) OR TITLE-ABS-KEY (pedodontics)) AND (INDEXTERMS (covid-19) OR TITLE-ABS-KEY (covid-19) OR TITLE-ABS-KEY (covid-19 pandemic) OR INDEXTERMS (sars-cov-2) OR TITLE-ABS-KEY (sars-cov-2) OR TITLE-ABS-KEY (coronavírus) OR TITLE-ABS-KEY (2019-nCoV))
Web of Science (https://clarivate.com/)	TS=(Pediatric dentistry OR Paediatric dentistry OR Pedodontics) AND TS=(Covid-19 OR Covid-19 pandemic OR SARS-CoV-2 OR Coronavírus OR 2019-nCoV)
Lilacs/ VHL (https://bvsalud.org/)	(mh:Pediatric dentistry OR Paediatric dentistry OR Pedodontics) AND (Covid-19 OR Covid-19 pandemic OR SARS-CoV-2 OR Coronavírus OR 2019-nCoV)

researchers (M.A.; T.R.), selected the studies by reading the titles and abstracts and applying the eligibility criteria. Studies with insufficient data in these sections were read in full. If the full text was not available, the study was excluded. Any doubts regarding the eligibility were resolved in consensus meetings with two experienced researchers (A.P.; L.P.). Subsequently, included studies were imported into a bibliometric data analysis software (VantagePoint® version 13.0, Search Technology, Inc.).

Data collection process concerning the main characteristics of the studies

Three researchers manually extracted data from included studies (M.A.; T.R.; M.S.). Each study was classified once within each category, according to i) study design, ii) sample, and iii) main subject.

The "study type" category was subdivided into review, clinical, or observational study. Regarding the "sample" category, the subtopics were children, adolescents, more than one population group (which included babies, children, and/or adolescents), dentists, parents, dental students, and not applicable (when the study had no sample, e.g., reviews). The "main subject" was assessed and classified as referring to dental emergencies, minimal intervention, teledentistry, biosafety, health education, and more than one subject.

Data regarding the types of clinical procedures and main emergencies reported in the included studies were retrieved manually and tabulated in an independent spreadsheet. In this section, the same study could be classified within multiple categories.

Bibliometric data collection and analysis

The following data were collected: title, keywords, authors, year of publication, journal, impact factor, and country of affiliation of the corresponding author. Author and journal data were manually reviewed by two authors (M.A.; T.R.). The data retrieval rate was greater than 90.0%, and the bibliometric evaluation of the extracted data was performed by an experienced researcher (A.F.G.) using the Vantage Point® and Microsoft Excel® programs.

The distribution of articles among the types of study design, main subjects, and year of publication was performed. For publication metrics, all journals were considered, as well as the correlation between study designs and journals. The SCImago Journal Rank (SJR) was consulted for each journal at https://www.scimagojr.com/, considering the year 2021.

A word cloud was built to indicate the frequency of citation of words in the title, abstract, or keywords list, considering words cited at least three times. The author metric was organized according to the number of publications, and only those who had two or more publications were included. In this analysis, the autocorrelation between the main authors was evaluated. A world map with the number of studies in each country and by continent was generated from the data referring to the country of affiliation of the corresponding author.

Then, the identification and distribution of the main dental emergencies, conducts, and clinical procedures were analyzed, considering only observational and clinical studies.

Results

Initially, 162 publications were identified in the databases, and, after removing the duplicates, 77 records remained. After the initial screening, 18 studies were excluded and 59 remained. The eligibility criteria were applied throughout the selection process. Ten articles were removed after full text reading, and 49 documents were included (Figure 1).

Among the study types, review (n = 25; 51.0%) and observational studies (n = 23; 47.0%) were the most observed. The distribution of study types in relation to the publishing journals and respective impact factors is shown in Figure 2.

Regarding the sample distribution, the largest group was "not applicable" (n=25; 51.00%), followed by "more than one population group" (n=14; 28.50%),

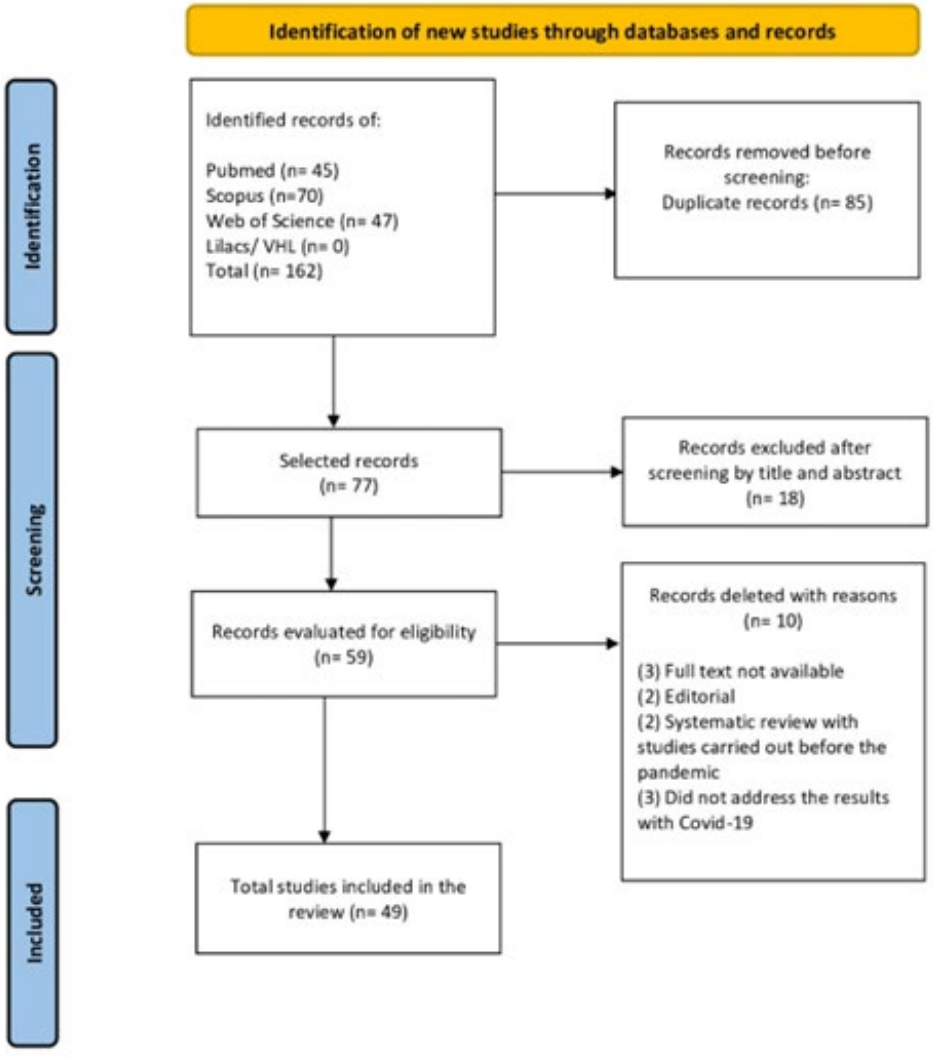

Figure 1. *Study selection flowchart.*

children and dentists (both with n=3; 6.12%), parents (n=2; 4.08%), and adolescents and students (both with n=1; 2.04%).

The main subjects discussed were dental emergencies (n=9; 18.30%), biosafety (n=8; 16.30%), teledentistry (n=6; 12.20%), minimal intervention (n=2; 4.00%), and health education (n=1; 2.00%), with most studies addressing more than one subject (n=23; 47.00%) (Table 2).

A total of thirty journals were identified (Figure 2). The International Journal of Pediatric Dentistry had the highest number of publications (n=6; 12.20%; impact factor: 1.18), followed by the International Journal of Clinical Pediatric Dentistry (n=5; 10.20%; impact factor: 1.10), and the European Journal of Pediatric Dentistry (n=4; 8.20%; impact factor: 0.7).

The word cloud produced with the words that were cited three or more times in the titles, abstracts, or keywords of the selected articles is represented in Figure 3. The most cited words were, respectively, "COVID-19," "pediatric dentistry," "dentistry," "children," and "child."

In total, 246 authors were identified in the 49 studies included in this review. Among these, twelve who published two or more studies composed the ranking of the

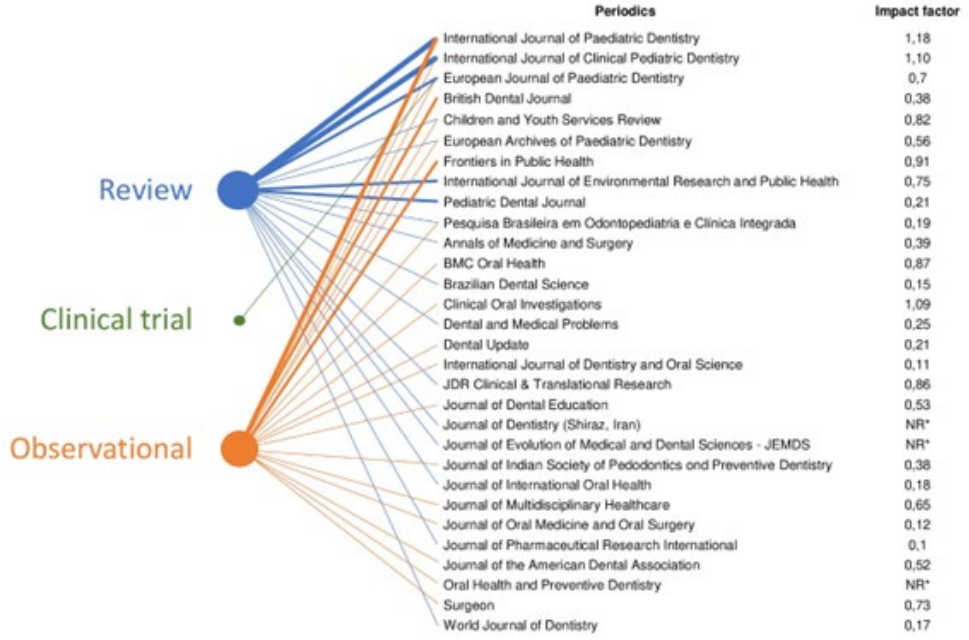

Figure 2. *Distribution of study designs in relation to journals where they were published and their respective impact factors.*

NOTE: The thicker the line, the greater the number of articles published in the journal. NR = not reported.

Table 2. *Distribution of subjects in relation to the type of study and year of publication.*

Subject	*Type of study*	*Year of publication*		
		2020	2021	Total
Dental Emergency	Clinical trial	1		1
	Observational study	1	7	8
Biosafety	Observational study		4	4
	Review	3	1	4
Teledentistry	Observational study	1	4	5
	Review	3	1	4
Minimal intervention	Review	1	1	2
Health education	Observational study		1	1
Multiple subjects	Observational study	2	3	5
	Review	11	7	18
		20	29	49

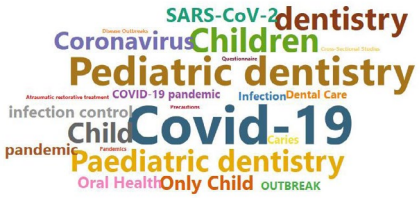

Figure 3. *Word cloud including keywords cited in three or more articles. The larger the font size, the greater its number of appearances.*

main authors. Most of the collaborations were among researchers from the same institution, and only one multicentre study, involving researchers from India and Saudi Arabia, was included (Figure 4).

The articles included were from sixteen countries. India published the most (n=11; 22.40%), followed by the United Kingdom (n=8; 16.30%), Italy (n=6; 12.20%), and Brazil (n=6; 12.20%) (Figure 5). Overall, the largest number of publications occurred on the Asian continent.

The distribution of dental emergencies and treatments is shown in Figures 6 and 7. The most reported dental emergencies were dental trauma (n=12; 63.10%), edema (n=9; 47.30%), and pain (n=9; 47.30%), followed by abscess (n=8; 42.10%), pulpitis (n=7; 37.00%), and dental caries (n=7; 37.00%). Among the procedures and clinical managements reported for pediatric dental care during the COVID-19 period, the most cited were tooth extraction (n=10; 53.00%), pulp therapy (n=9; 47.30%), restoration (n=8; 42.10%), and medication prescription (n=6; 31.60%).

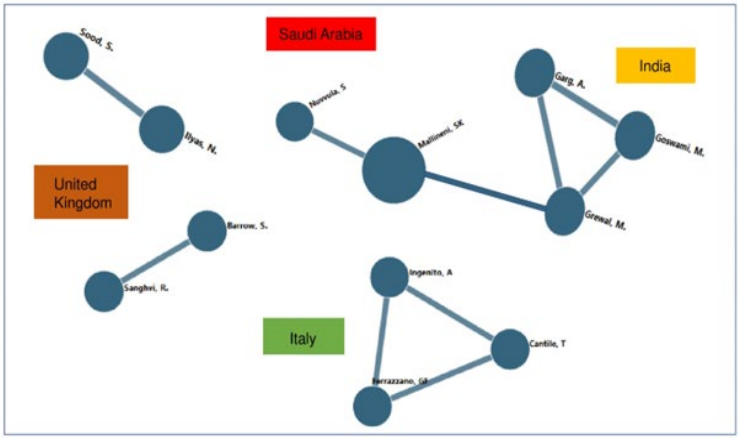

Figure 4. Authors who published two or more articles and their respective countries.

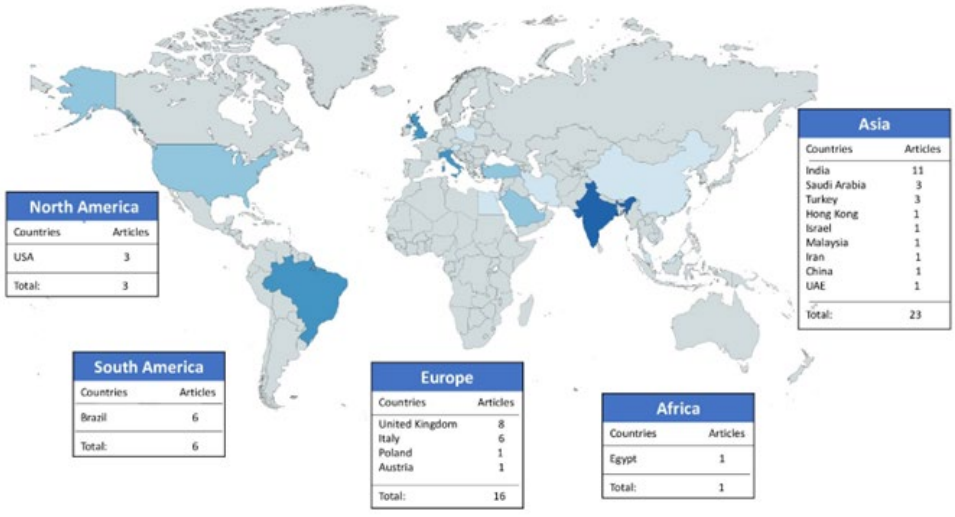

Figure 5. World map illustrating the density of publications by continent.

Figure 6. Main dental emergencies reported in articles during the COVID-19 pandemic.

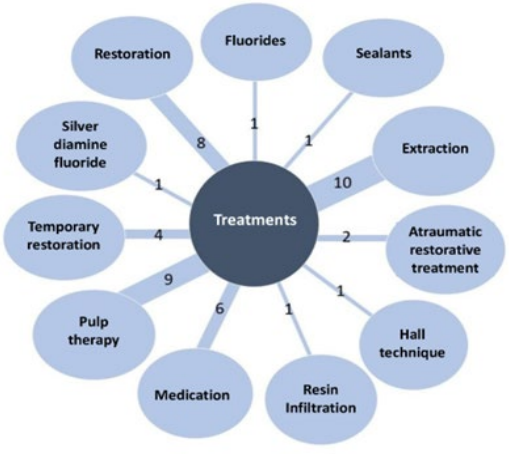

Figure 7. Conducts and clinical procedures most reported in articles for pediatric dental care during the COVID-19 pandemic.

Discussion

Bibliometric methods have been used to quantitatively assess the current literature on a given topic, allowing the identification of research trends and knowledge gaps, in addition to providing data on the contribution of countries and collaboration between authors.[10] To date, this is the first bibliometric study that provides a comprehensive overview of scientific research related to COVID-19 in pediatric dentistry. Although several bibliometric reviews were published evaluating COVID-19 in the field of medicine,[11-13] only one study evaluated COVID-19 and dentistry,[14] and none in pediatric dentistry. Thus, the results of this review filled this gap in the literature by showing clinical recommendations related to COVID-19 in pediatric dentistry in addition to the bibliometric data.

The most predominant study design was literature review, followed by observational studies, which could be explained by the restrictions to dental treatment and research, due to the high global mortality rate of the disease.[15] This finding was reported previously,[14] indicating that when compared to medical research, the level of evidence in the dental scientific literature regarding COVID-19 is low. A total of 49 articles were included in this review. When compared to other areas, this data reveals that the research fell far short of what occurred in dentistry (n= 296),[14] in pediatric medicine (n= 2301)[13], and general medicine (n= 4092).[11] Most studies were published in pediatric dentistry journals. However, publications in dentistry, public health, surgery, medicine, and pharmacy were also observed. This reflects the efforts of researchers to add knowledge to the scientific community regarding pediatric dental care.

The main issues addressed in the included studies involved the recommendations regarding dental care and biosafety. In addition, teledentistry as an innovative dental care practice, minimal intervention techniques, and health education were also discussed. The word cloud analysis revealed that the most frequent terms were “COVID-19,” “pediatric dentistry,” and “children,” followed by “oral health,” “infection control,” and “dental care,” indicating the concern of researchers with the biosafety and oral health of children.

Considering the high rates of contamination and mortality of the countries that published most of the studies, their contributions were already expected. However, despite the USA and China being reported in other bibliometric studies as two of the countries with the highest number of publications,[12-14] these data were not repeated in the pediatric dentistry research. Regarding the authors’ collaborations, four main clusters of collaboration were identified between authors with two or more publications in India, the UK, Italy, and Saudi Arabia.

Daily life has changed dramatically due to the pandemic, especially for children and teenagers with the suspension of in-person school and sports activities.[16] An increase in the intake of foods rich in carbohydrates due to the anxiety generated by being confined due to social restrictions was observed.[16] This change may impact children's general and oral health. Furthermore, a reduction

in the number of dental appointments occurred during the pandemic,[17-20] due to health authorities' recommendations. In addition, parents' belief of the potential risk of contamination of the dental environment may have hindered the seeking for dental treatment of otherwise urgent cases.[21] Considering that the home environment could make the child more likely to suffer dental trauma from falls,[22] this was the most frequently reported urgency, followed by swelling, pain, abscess, dental caries, and pulpitis.

In this sense, the most performed procedures were extraction and pulp therapy, although extraction was the treatment of choice during the pandemic due to its lower production of aerosols. It is important to emphasize that a lack of prevention and treatment can have a harmful impact on children's oral health, causing them to need more invasive treatments later due to the long period of deprivation of care.[23,24]

To minimize risks, dentists had to seek to resolve cases more quickly, whenever possible using minimal intervention approaches to reduce aerosol production, in addition to reinforcing effective protocols to prevent cross-infection.[25] The first precaution that should be taken when starting child dental care is appropriate behaviour management. It is worth remembering that crying and restless negative behaviour spread large amounts of aerosol. It is important to consider that extra individual protection measures can make children more anxious and afraid. Hence, it is essential to develop a confident relationship between caregivers/dentist/child, and that the professional makes efforts to present the personal protective equipment in a playful and non-intimidating way for the patient.[26] Teledentistry was suggested as a very interesting method to present the dental procedures to the child explaining what would be done through easy and age-appropriate language.[27]

Teledentistry, in addition to being safe and verifying the need for face-to-face emergency care, has become a prevention tool to educate parents, support primary health care, and help minimize the negative impacts of the pandemic.[16,28] With the demand for changes in care, the video approach has become an alternative for dental consultations, aiding in diagnosis and reducing unnecessary visits to the office.

Regarding procedures, most literature reviews addressed minimally invasive treatments, which have the benefit of low or no aerosol production, reduced time for dental appointments, and reduced risk of contamination[29] such as atraumatic restorative treatment (ART), silver diamine fluoride, and the Hall Technique. However, few observational and clinical studies have reported their use. This result should be interpreted with caution, since not all included studies provided details about the technique used for the removal of carious tissue, for example. Nevertheless, this study provided important information that will help guide future research related to dental care in pediatric dentistry in times of COVID-19.

Conclusion

Based on this study's results, the following conclusions can be made:

Most of the studies were published in Asia and were of review type.

The most reported subject regarding pediatric dentistry in the COVID-19 pandemic was dental emergencies, mainly trauma, and the most performed treatment was extraction.

Acknowledgments:

This study was financed in part by the Coordination for the Improvement of Higher Education Personnel (CAPES) – Finance code 001 and Carlos Chagas Filho Foundation for Research Support of the State of Rio de Janeiro (FAPERJ) N° E-26/202-399/2017, E-26/210.352/2019, APQ1 - 210.352/2019, E-26/203.868/2022 and E-26/202.766.2019.

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Recibido: 1/11/22
Aceptado: 3/2/23
Correspondencia: Jenné Allegretto, correo: michelle.jenne@hotmail.com