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IMPACTO DA PANDEMIA DA COVID-19 NO ENSINO E USO DO DIAMINO FLUORETO DE PRATA E RAZÕES DE FALHAS DE PULPECTOMIAS: DA MÍNIMA A MÁXIMA INTERVENÇÃO EM DENTES DECÍDUOS

Santa Maria, RS
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Tese apresentada ao Programa de Pós-Graduação em Ciências Odontológicas, da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para obtenção do título de **Doutora em Ciências Odontológicas com ênfase em Odontopediatria**.

Orientador: Profa. Dra. Rachel de Oliveira Rocha

Santa Maria, RS
2022

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Aprovada em 29 de setembro de 2022.

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Rachel de Oliveira Rocha, Dra. (UFSM)
(Presidente/Orientadora)

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Prof. Dra. Carine Weber Pires (UFSM)

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Prof. Dra Graziela Botton (UFSM)

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Prof. Dra. Simone Tuchtenhagen (URI-Erechim)

Santa Maria, RS
2022

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RESUMO

IMPACTO DA PANDEMIA DA COVID-19 NO ENSINO E USO DO DIAMINO FLUORETO DE PRATA E RAZÕES DE FALHAS DE PULPECTOMIAS: DA MÍNIMA A MÁXIMA INTERVENÇÃO EM DENTES DECÍDUOS

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A presente tese é composta por dois artigos científicos cujos temas principais são o impacto da COVID-19 no ensino e uso do diamino fluoreto de prata (DFP) e razões de falhas de pulpectomias em dentes decíduos. Artigo 1: *The impact of COVID-19 pandemic on silver diamine fluoride use in Pediatric Dentistry in Brazilian dental schools: a cross-sectional questionnaire-based survey.* O objetivo deste estudo foi avaliar o impacto da pandemia de COVID-19 no ensino e uso do DFP nas disciplinas de Odontopediatria dos cursos de graduação do país. Um questionário online, incluindo 6 perguntas sobre ensino e uso do DFP antes, durante e após a pandemia, foi enviado para 265 cursos. 65 respostas obtidas foram analisadas descritivamente e pelo teste do qui-quadrado. Mesmo com o início da pandemia do COVID-19, com a preconização de tratamentos menos invasivos e com menor emissão de aerossol, o DFP não é tema de aulas teóricas em 13,8% das faculdadese 23,1% dos cursos não incluíram o DFP na prática clínica. A pandemia de COVID-19 não impactou o ensino e o uso do DFP nas faculdades de odontologia brasileiras. Artigo 2: *Reasons for failure in primary molars' pulpectomies: A systematic review.* Este trabalho revisou sistematicamente estudos clínicos avaliando as pulpectomias em molares decíduos com pelo menos 1 ano de acompanhamento visando identificar as razões de falha. Dos 2.784 estudos potencialmente elegíveis encontrados nas bases de dados eletrônicas PubMed, Scopus, ISI Web of Science, Scielo e Cochrane Library 34 preencheram os critérios de inclusão. A taxa de falha das pulpectomias variou de 0% a 46% nos estudos analisados. As falhas das pulpectomias foram avaliadas clínica e/ou radiograficamente em quase todos os estudos, porém, encontrou-se informações incompletas ou pouco claras sobre as razões para falhas.

Palavras-chave: Cariostático. Ensino. Odontopediatria. Pulpectomia. Dente decíduo.

ABSTRACT

IMPACT OF THE COVID-19 PANDEMIC ON THE TEACHING AND USE OF SILVER DIAMINE FLUORIDE AND REASONS FOR PULPECTOMY FAILURES: MINIMUM TO MAXIMUM INTERVENTION IN PRIMARY TEETH

AUTHOR: Débora Santos Sityá
ADVISOR: Rachel de Oliveira Rocha

This thesis is composed of two scientific articles whose main themes are the impact of COVID-19 on the teaching and use of silver diamine fluoride (SDF) and reasons for pulpectomy failures in primary teeth. Article 1: *The impact of COVID-19 pandemic on silver diamine fluoride use in Pediatric Dentistry in Brazilian dental schools: a cross-sectional questionnaire-based survey*. The aim of this study was to evaluate the impact of the COVID-19 pandemic on the teaching and use of SDF in Pediatric Dentistry in country graduation courses. An online questionnaire, including six questions on teaching and using the SDF before, during and after the pandemic, was sent to 265 courses. The 65 answers were analyzed descriptively and using the chi-square test. Even with the onset of the COVID-19 pandemic, SDF is not a theoretical class topic in 13.8% of dental schools and 23.1% of dental schools have not included SDF in clinical practice. The COVID-19 pandemic has not impacted the teaching and use of SDF in Brazilian dental schools. Article 2: Reasons for failure in primary molars' pulpectomies: A systematic review. This study systematically reviewed clinical studies evaluating pulpectomies in primary molars with at least 1 year of follow-up, aiming to identify the reasons for failure. Of the 2.784 potentially eligible studies in PubMed, Scopus, ISI Web of Science, Scielo and Cochrane Library electronic databases, 34 met the inclusion criteria. The failure rate of pulpectomies ranged from 0% to 46%. Failures of pulpectomies were evaluated clinically and/or radiographically in almost all studies, however, incomplete or unclear information was found on the reasons for failures.

Keywords: Cariostatic Agents. Teaching. Pediatric Dentistry. Pulpectomy. Primary tooh.

SUMÁRIO

1. INTRODUÇÃO

A manutenção do dente decíduo na cavidade bucal até seu período de exfoliação fisiológica é o centro de estudo e objetivo almejado na prática clínica quando se refere a Odontopediatria. Tendo em vista as funções que os elementos decíduos desempenham no desenvolvimento e crescimento da criança, bem como: fala, mastigação, oclusão, desenvolvimento dos músculos e ossos da face, qualidade de vida e bem estar social, a Odontopediatria busca evitar a perda precoce, seja por cárie ou por traumatismos dentários. (ALENCAR, CAVALCANTI, BEZERRA, 2007).

A Odontopediatria tem buscado técnicas e tratamentos minimamente invasivos como alternativas de tratamento e manutenção da função da dentição primária. Dentre elas, cita-se o crescente uso do diamino fluoreto de prata (DFP), com o objetivo de paralisar o avanço de lesões cariosas, evitando tratamentos mais invasivos, especialmente em crianças com comportamento difícil. Além disso, o DFP apresenta ótimo custo-benefício como técnica de tratamento da doença cárie, sendo amplamente indicado para utilização em saúde pública.(SLAYTON et al., 2018; CORRÊA-FARIA et al., 2020; TEDESCO et al., 2018; WRIGTH, WHITE, 2017)

Em vista disso, percebe-se um aumento do ensino do uso de cariostáticos no Brasil nos últimos anos, porém sem uma aplcação em frequência adequada de uso na prática clínica nos casos indicados. (FROHLICH, LEITE, ROCHA, 2022) Ademais, oDFP teve seu uso intensamente incentivado desde o início da pandemia da COVID-19, como alternativa de tratamento com menos riscos de exposição dos profissionais e pacientes, tendo em vista a redução da emissão de aerossóis. (BANIHANI et al., 2020; CASAMASSIMO, TOWNSEND, LITCH, 2020) Assim, o primeiro artigo exposto nesta tese teve como objetivo verificar o impacto da pandemia da COVID-19 no ensino e frequência uso do DFP em cursos de graduação no Brasil.

No entanto, o DFP tem seu uso restrito a dentes vitais e assim, para dentes com envolvimento pulpar com inflamação pulpar irreversível ou necrose, tem-se como indicação na prática clínicatécnicas de máxima intervenção, como a realização de pulpectomias, a fim de evitar a perda precoce buscando a manutenção das funções dos dentes decíduos no desenvolvimento da criança. (CUNHA, BARCELOS, PRIMO, 2005; CAMP, 2008; BARJA-FIDALGO et al., 2011). Porém, por se tratar de um procedimento de alta complexidade e sensível a variáveis como condições operatórias, técnica e materiais, percebe-se a necessidade de mais estudos para identificar as razões de falha das pulpectomias, que chega a 62,9% após 12 meses de acompanhamento. (BRUSTOLIN ET

AL., 2016)Entende-se que a identificação dos fatores específicos que levam a falha do tratamento, podemos buscar o aprimoramento da técnica e, como consequência melhorar o prognóstico do tratamento, evitando a exodontia precoce do dente. O objetivo do segundo estudo exposto na presente tese foi identificar, por meio de uma revisão sistemática da literatura, as principais razões de falhas de pulpectomias realizadas em dentes decídudos.

2. ARTIGO 1 - THE IMPACT OF COVID-19 PANDEMIC ON SILVER DIAMINE FLUORIDE USE IN PEDIATRIC DENTISTRY IN BRAZILIAN DENTAL SCHOOLS: A CROSS-SECTIONAL QUESTIONNAIRE-BASED SURVEY

Este artigo será submetido ao periódico *Brazilian Oral Research, ISSN:18073107*; Fator de impacto = 2.674; Qualis A2. O artigo está de acordo com as normas desse periódico, que estão descritas no Anexo A.

Article type: Cross-sectional

The impact of COVID-19 pandemic on silver diamine fluoride use in Pediatric Dentistry in Brazilian dental schools: a cross-sectional questionnaire-based survey

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Abstract

This cross-sectional questionnaire-based survey aimed to evaluate the impact of the COVID-19 pandemic on silver diamine fluoride (SDF) teaching and use in Pediatric Dentistry in Brazilian dental schools. A non-validated online questionnaire including six closed-ended questions regarding teaching and using SDF before, during, and after the pandemic was sent by email to 265 Brazilian dental schools. Responses were analyzed descriptively and using the chi-square test. Responses from 25 public and 40 private schools were considered. 12.3% of dental schools did not consider the SDF as a theoretical topic of lectures even after the COVIC-19 pandemic began. SDF teaching will be discontinued after the end of the COVID-19 pandemic in 10.8% and 16.9% schools, respectively. SDF was not included in clinical practice after the pandemic began in 21.5% of dental schools. Few dental schools did not consider the SDF in theoretical classes and clinical practice. However, the COVID-19 pandemic did not impact SDF teaching and use in Brazilian dental schools.

Key-words: Dental Caries, Cariostatic Agents, Pediatric Dentistry, Education, Dental, Survey and Questionnaires

Introduction

The coronavirus disease-19 (COVID-19) pandemic has severely impacted several aspects of human life, including health care. After the first months of the pandemic, in which dental care was restricted to emergency care, minimally interventive procedures, reducing or eliminating aerosol generation were encouraged.[1] Silver diamine fluoride (SDF) has not received enough attention until recently; although being introduced in Japan in the 1970s, it was included in the recommended procedure list, whereas it is a non-surgical treatment, easy to apply, and well accepted by children,[2] inexpensive and is a nonaerosol-generating procedure, being a great alternative treatment for public health.

SDF is an effective treatment for caries arrestment in primary teeth, compared to placebo or other active treatments (fluoride varnish and ART restorations).[3,4] Although there is no defined standard protocol, and it varies among the clinical studies[5], SDF has also proven effective in reducing the development of new dentin caries lesions.[6] Despite that, SDF treatment results in the dark staining of enamel and dentin caries lesions with aesthetic concern, mainly in anterior teeth.[7] Thus, it can be considered a barrier not only to its clinical use but also to its inclusion as part of the dental school curricula.[8]

Recent studies highlight that SDF is not currently taught and used in clinical practice in undergraduate courses.[8-10] Interestingly, Frohlich et al. reported in 2022 that SDF was a topic in formal lectures in 73.8% of Brazilian dental schools; however, only 11.4% of schools reported the frequent use of SDF in clinical practice. A similar trend was described by U.S. pediatric dentists;[9] 70% of respondents related never, rarely, or sometimes using SDF to arrest dental caries in primary teeth.

It is to be expected that the pandemic may have impacted the teaching and use of diamine in Pediatric Dentistry as Minimally invasive treatments were recommended.[11,12] Thus, this study aimed to impact of COVID-19 pandemic on silver diamine fluoride use in Pediatric Dentistry in Brazilian dental schools. The tested hypothesis was that the use of SDF increased during the pandemic.

Methods

Study design

The present cross-sectional questionnaire-based study was conducted on undergraduate dental schools in Brazil between March 19 and July 30, 2022. A non-validated online questionnaire evaluating the SDF use and teaching in Pediatric Dentistry in

undergraduate dental schools before, during and after the COVİD-19 pandemic was constructed. All participants who gave the required written permission to participate in the study were included. The study protocol was approved by the Institution's Research Ethics Committee (CAAE 08116619.2.0000.5346) and conducted according to the STROBE Statement (Strengthening the reporting of observational studies in epidemiology)[13]

Population

For the current study, a convenience sample of 265 undergraduate dental schools registered at the Federal Council of Dentistry was selected. Participants were invited among the heads or other staff members of the section of the Pediatric Dentistry department of each dental school. The online questionnaire (Google Forms) and the Free and Written Informed Consent Form were sent to one member of each dental school.

Data collection

The questionnaire is a six-item that asks for the teaching of SDF before (item one "Was the SDF a theoretical topic of lectures in the Pediatric Dentistry undergraduate section before COVID-19 pandemic?" and during the COVID-19 pandemic (item two "Was the SDF included as a theoretical topic of lectures in the Pediatric Dentistry undergraduate section after the COVID-19 pandemic began?"). Also, questions regarding the use of SDF before and during the COVID-19 pandemic (item three "Was the SDF used in the clinical practice of the Pediatric Dentistry undergraduate section before the COVID-19 pandemic?" and in case of a negative answer, item four "If not, has it been used in clinical practice during/after pandemic COVID-19?"). Also, two questions about the continuity of SDF teaching and use after the pandemic were included (item five, "Will SDF continue to be a topic of lecture after the end of the COVID-19 pandemic?" and item six, "Will the SDF continue to be used in the clinical practice of the Pediatric Dentistry undergraduate section after the end of the COVID-19 pandemic?").

The questionnaires were sent, by email, three times to each participant in case of no response. Each participant could fill out the questionnaire only once, and just one response was considered by each institution. No demographic data were collected from respondents.

Statistical analysis

Statistical analysis consisted of descriptive statistics; categorical variables were considered absolute and relative frequencies, compared by the chi-square test. Data were analyzed by Minitab Express statistical program (Minitab Inc, State College, PA, USA).

Results

Of the total of 265 eligible dental schools, 20 were excluded as Pediatric Dentistry was not a discipline at the time of the study. Sixty-five questionnaires were returned (an overall response rate of 26.5%). The survey process is illustrated in Figure 1.

Answered questionnaires were from public and private schools, most of them from the Southeast regions of Brazil (Chi-square 27.8; p = 0.00) (Table 1). Before the COVID-19 pandemic started, SDF was not a theoretical topic of lectures in the Pediatric Dentistry in 17 schools (26.2%; Chi-square 14.8; p = 0.00), and continued to be disregarded in 9 from these schools (47.1%; Chi-square 0.06; p=0.81). Regarding the use of SDF in clinical practice before the COVID-19 pandemic, 42 respondents pointed out it was used, even though rarely in some schools (21; 32.2%). Twenty-three responses were negative; i.e., SDF was not used before the COVID-19 pandemic, and 14 respondents from these (21.5%) stated that they did not use the SDF even after the pandemic started. For the two questions about teaching and using the SDF after the COVID-19 pandemic ended, 58 (89.2%) and 54 (83.1%) answers were affirmative, respectively. Descriptive data are presented in Table 2.

Discussion

The management of carious lesions has changed over the years, especially in children. Minimally invasive procedures, as the use of SDF, have been suggested not only for their effectiveness but also for their simplicity and low cost.[14] High-quality evidence supports the assumption that SDF is more effective in controlling caries lesions in primary teeth than other treatments.[3] Nevertheless, SDF is not commonly used in Brazilian dental schools, despite being considered a theoretical topic of lectures in the Pediatric Dentistry undergraduate section.[10]

After March 2020, when the World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic,[15] aerosol-generating dental procedures were restricted and discouraged, increasing the minimal intervention techniques in caries management, including SDF.[16,17] Therefore, it can be expected that the pandemic has impacted the teaching and use of SDF in dental schools, especially given the results of a previous study

in Brazilian dental schools.[10] Even though the lower response rate than that obtained previously,[10] equally the percentage of almost 26% of responding schools did not consider the SDF as a theoretical lecture topic before, and almost 47% of them did not include it even after the COVID-19 pandemic. Similarly, approximately 35% of schools did not use the SDF in undergraduate clinical practice. Among the schools that answered that they did not use diamine before the pandemic, only 39.1% reported that the SDF was now used in a clinical routine of the Pediatric Dentistry section. These results indicate that the COVID-19 pandemic did not impact the teaching and use of SDF in Brazilian dental schools.

Two relevant collaborative documents,[18,19] including the Brazilian Association of Pediatric Dentistry, have recommended using SDF to control carious lesions, mainly in dentin. Besides, SDF was also included in a spectrum of techniques to control the progression of carious lesions with significant importance during the COVID-19 pandemic.[20] Therefore, it is crucial to consider the SDF in the dental school's curriculum to comply with these documents. Nevertheless, there are still schools that do not include the SDF in the Pediatric Dentistry curriculum (12.3%). Likewise, the use of the SDF was not introduced in the clinical routine during the pandemic and will not be even after the pandemic is over. It is essential to consider that, although not significantly different, more private schools answered the questionnaire (61.5%) than public dental schools. Also, the number of responding schools in southeastern Brazil was higher than in other regions. Both the type of school by funding and geographic location may have influenced the results obtained regarding the teaching and use of SDF. Regional inequalities seem to impact not only the DMFT (lower DMFT values are observed in Brazilian southern and southeastern regions) but also the access to dental services and the profile of dental procedures[21].

Black staining is an undesirable effect of SDF and a common concern, particularly in anterior teeth. It may be another reason for the non-inclusion of the SDF in theoretical classes and the clinical practice of Pediatric Dentistry in schools in the country. Professionals tend to be less accepting of the SDF staining effect; consequently, the choice of SDF as a treatment option is neglected.[22] However, it is known that parents are more accepting of the SDF when they receive information regarding SDF benefits and effectiveness[23,24].

The findings of this study have to be seen in the light of some limitations. Only questions regarding the teaching and use of SDF before, during, and after the COVID-19 pandemic was included. The previous study[10] included more comprehensive questions about the concentration of the product, indication for the type of tooth, lesion, and age of the patient. The proximity between the two studies justifies the inclusion of a few questions and may also explain the low response rate, which is a severe limitation of this study and an

inherent limitation of studies in questionnaire form. Nevertheless, the results of the present study point to the necessary discussion about the Pediatric Dentistry undergraduate curriculum in Brazilian dental schools, particularly about the teaching and use of the SDF.

Conclusion

Based on this questionnaire-based study, the COVID-19 pandemic did not impact silver diamine fluoride teaching and use in Pediatric Dentistry in Brazilian dental schools. However, it will remain considered in lectures and clinical practice after the pandemic.

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Figure 1. Flow chart diagram for the questionnaire survey process.

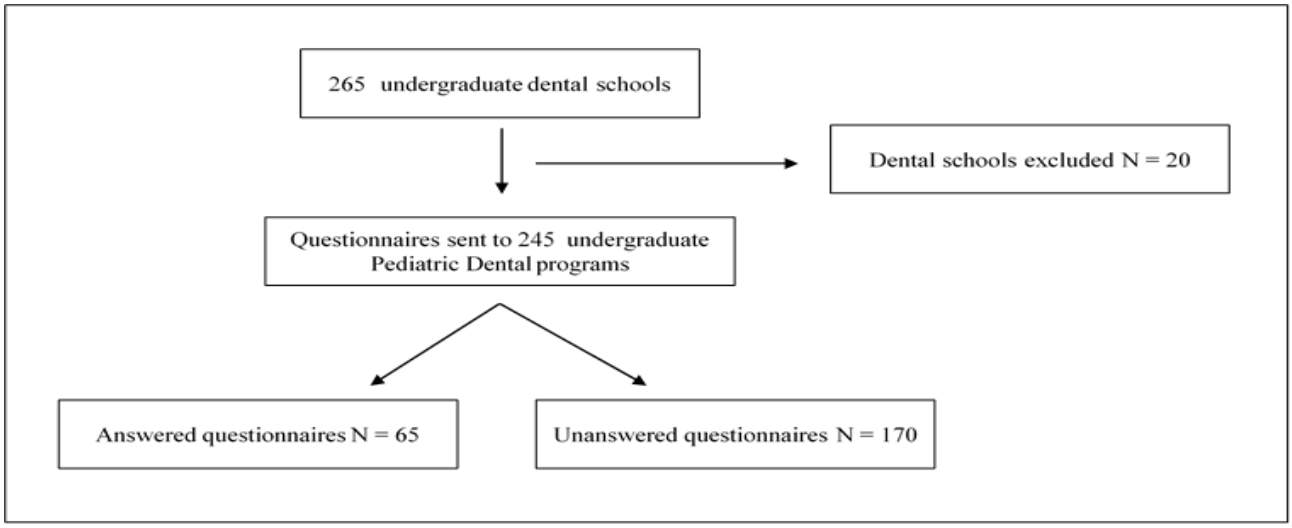
265 undergraduate dental schools
Dental schools excluded N = 20
Questionnaires sent to 245 undergraduate Pediatric Dental programs
Answered questionnaires N = 65
Unanswered questionnaires N = 170

Table 1. Distribution of dental schools by type and geographic location (number and percentage of schools)

	Type of school by funding		
Country region	**Public**	**Private**	**Total**
North	1 (1.5%)	2 (3.1%)	3 (4.6%)
Northeast	6 (9.2%)	6 (9.2%)	12 (18.5%)
Central-West	1 (1.5%)	2 (3.1%)	3 (4.6%)
Southeast	13 (20.0%)	19 (29.2%)	32 (49.2%)
South	4 (6.1%)	11 (16.9%)	15 (23.8%)
Total*	**25 (38.5%)**	**40 (61.5%)**	

*Chi-square: 3.46; p=0.06

Table 2. Questionnaire responses according question

Question	**N (%)**	**Chi-square; p value**
Was the SDF a theoretical topic of lectures in the Pediatric Dentistry undergraduate section before COVID-19 pandemic?		
Yes	48 (73.8%)	
No	17 (26.2%)	14.8; p=0.00
*Was the SDF included as a theoretical topic of lectures in the Pediatric Dentistry undergraduate section after the COVIC-19 pandemic began?**		
Yes	9 (53.0%)	
No	8 (47.0%)	0.06; p=0.81
Was the SDF used in the clinical practice of the Pediatric Dentistry undergraduate section before the COVID-19 pandemic?		
Yes, frequently	6 (9.2%)	
Yes, sometimes	15 (23.1%)	
Yes, rarely	21 (32.3%)	
No	23 (35.4%)	10.7; p=0.013
*If not, has it been used in clinical practice during/after pandemic COVID-19? began**		
Yes	9 (39.1%)	
No	14 (60.9%)	1.09; p=0.30
Will SDF continue to be a topic of lecture after the end of the COVID-19 pandemic?		
Yes	58 (89.2%)	
No	7 (10.8%)	40.01; p=0.00
Will the SDF continue to be used in the clinical practice of the Pediatric Dentistry undergraduate section after the end of the COVID-19 pandemic?		
Yes	54 (83.1%)	
No	11 (16.9%)	28.44; p=0.000

* Only those who answered negatively to the previous question were asked to respond.

3. ARTIGO 2 – REASONS FOR FAILURE IN PRIMARY MOLAR'S PULPECTOMIES: A SYSTEMATIC REVIEW

Este artigo será submetido ao periódico *Pediatric Dentistry*; ISSN:01641263 ; Fator de impacto = 3.264; Qualis A2. O artigo está de acordo com as normas desse periódico, que estão descritas no Anexo B.

Article type: Systematic review

Reasons for failure in primary molars' pulpectomies: A systematic review

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The responsibility of Débora S. Sityá was to acquire, analyze, and interpretation of data; drafting the work.

Mariana D. Bellinaso's responsibility was to acquire, analyze and interpret data, drafting the work.

Rachel de O. Rocha's responsibility was to conceive, revise and approve the final version to be published.

• Abstract: number of words **247**.

• Body of text (excluding Abstract, Acknowledgments, References, Figures and Tables): number of words 2662.

• Number of tables: 3

• Number of figures: 2.

Reasons for failure in primary molars' pulpectomies: A systematic review

Failures in pulpectomies

Abstract

Research question: To systematically review the literature of prospective clinical studies to identify the reasons for pulpectomies' failure in primary molars.

Research protocol: This systematic review protocol was registered on the International Prospective Register of Systematic Reviews (PROSPERO 2018 CRD42018109800) and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

Literature search: The electronic databases (PubMed, Scopus, ISI Web of Science, Scielo, and Cochrane Library) were screened, and eligible studies, published up to September 2022, were searched to select studies evaluating the pulpectomies in primary teeth at least one year of follow-up.

Data Extraction: Data extraction was performed independently by two reviewers using a standardized extraction tool, including reasons for failure and the evaluation criteria of failure.

Quality Appraisal: The risk of bias (ROB 2) was assessed considering the items: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other sources of bias, such as sample size and examiner calibration.

Data Analysis and Results: Out of 3128 potentially eligible studies, 89 were selected for full-text analysis, and thirty-four met the inclusion criteria. Approximately 1959 primary molars were treated in 1623 children (ages 2 to 13 years old). The failure rate of pulpectomies ranged from 0% to 46%. Incomplete or unclear descriptions of reasons for failure were common in primary studies.

Interpretations of Results: In almost all studies, pulpectomies' failures were assessed by clinical and/or radiographic evaluation with a great variability of the criteria that define treatment failure.

Key-words: pulpectomy, root canal therapy, tooth, deciduous

INTRODUCTION

Dental caries remains a highly prevalent disease in large part of the global population, compromising pulpal health in several cases.[1,2] Therefore, root canal therapy has been recommended by many authors to maintain primary teeth in the oral cavity until the period of physiological exfoliation, avoiding functional and aesthetic sequelae of early tooth loss.[3,4] Pulpectomy is indicated for irreversible pulp inflammation or pulpal necrosis. During the treatment, the necrotic pulp and organic debris are removed, root canals are mechanically prepared and disinfected, and the canals are filled with resorbable material.[5] Definitive restoration is necessary to seal the pulpectomized teeth adequately.

Previous systematic reviews accessed root canal therapy's effectiveness in primary teeth;[6,7] however, there are disagreements on the technique and material to root canal obturation. Besides that, there is also no consensus on teaching of pulp therapy in primary teeth in dental schools due to the inconsistency and lack of high-level scientific evidence studies to determine the best technique and materials to be used.[4,6] Several reasons lead to an unfavorable outcome of endodontic treatment in primary teeth. The inherent complexity of the root canal system, which hinders the chemical-mechanical preparation, and consequently, the control of the microbiota; the difficulty of inserting the endodontic paste into the total working length of the canals; and the management of the child's behavior during the procedure, are conditions that may contribute to the treatment failure and consequently early tooth loss.

Studies[7-11] have demonstrated different failure reasons and variated success rates of pulpectomies in primary teeth. Failures have been related to different techniques and materials used in root canal therapy and patients' particularities, such as oral health conditions and socioeconomic status. This fact is one of the main obstacles to adopting a protocol or consensual attitude for teaching the clinical approach for pulp therapy of primary teeth in institutions.[7,12] Accurate identification of the reasons for failure might guide the improvement of the root canal therapy in primary teeth and favor the clinical decision-making regarding pulpectomy vs. extraction of primary teeth. Thus, systematic reviews are an essential tool in the decision-making process. Therefore, this systematic review of prospective clinical studies was performed to identify the main reasons for pulpectomies' failure in primary molars.

METHODS

This systematic review protocol was registered on the International Prospective Register of Systematic Reviews (PROSPERO 2018 CRD42018109800). This systematic review was performed according to the Cochrane Handbook for Systematic Reviews of Interventions[13] and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[14] and the Synthesis without Meta-Analysis (SWiM) guidelines.[15] The addressed focused question was developed based on the acronym PECO (participant, exposure, comparator, and outcome), in which primary molars were the “participant”; the pulpectomy was the “exposure” and the “control”, and the "outcome" was the failure mode. Thus, the addressed focused question was: **“What is the main reason for failures in pulpectomies in primary molars?”**

Search strategy

A comprehensive literature search was performed in the electronic databases PubMed, Scopus, ISI Web of Science, Scielo, and Cochrane Library to identify all studies published up to September 2022 reporting failures of pulpectomies in primary molars. The PubMed database's search strategy was formulated with the combination of MeSH terms and free terms as follows the structured search strategies detailed in Table 1. The following search algorithm was used for search in the Cochrane Library: “pulpectomy OR root canal therapy OR endodontics AND deciduous tooth OR primary teeth OR deciduous teeth OR primary tooth”; ISIS Web of Science: PULPECTOMY AND PRIMARY TEETH; Scopus: “(TITLE-ABS-KEY (pulpectomy) AND TITLE-ABS-KEY (deciduous AND tooth) OR TITLE-ABS-KEY (primary AND teeth) OR TITLE-ABS-KEY (deciduous AND teeth) OR TITLE-ABS-KEY (primary AND tooth))”; Scielo: “(PULPECTOMY) AND (PRIMARY TEETH)) OR (PRIMARY TOOTH)) OR (DECIDUOUS TEETH)) OR (DECIDUOUS TOOTH))”.

Study selection and Eligibility

The records of all databases were uploaded into a standardized form (Microsoft Office Excel 2016, Microsoft Corporation, Redmond, WA, USA), and the duplicates were identified and manually removed. Thus, the title and abstract of identified studies were

assessed by two independent reviewers (D.S.S. and M.D.B.) and selected according to the inclusion criteria: (1) prospective trials evaluating any technique or material for pulpectomy in primary molars, (2) written in English, and (3) with a minimum of follow-up of one year. The same reviewers independently evaluated the full text of all eligible articles for the final decision regarding inclusion. Studies were excluded if, the failure assessment was not reported, or the author did not provide it on request, and studies that did not access root canals. In case of disagreement, the articles were discussed to obtain consensus. If no consensus was reached, a third experienced researcher (R.O.R.) was recruited for the final decision. The references of all eligible studies were screened and cross-referenced.

Data extraction

Data extraction was performed independently by two reviewers. Differences in the collected data were reconciled by discussion. A standardized extraction tool was developed, and the following items were collected: first author's name, year of publication, country of the first author, aim of the study, study design, clinical setting, manufacturers research grant, time of follow-up, number of participants and age, number of pulpectomized teeth at baseline and in the last follow-up, endodontic material (root canal filling, irrigant solution, intracanal medication), restorative material, use of rubber dam, evaluation criteria, factors associated with failure, reasons for failure.

Outcome

The outcome was the reason for the failure of pulpectomies in primary molars, and it was categorized according to clinical and radiographic criteria. When no adequate failure mechanism could be identified within the clinical or radiographic criteria, the reason for failure was classified as unclear.

Assessment of Risk of Bias

The risk of bias in the included studies was assessed based on the Cochrane Collaboration risk of bias tool (RoB 2).[16] Studies were evaluated considering the domains: randomization process, deviations from the intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result. Two reviewers evaluated independently the. Risk of bias and the disagreements between the reviewers were resolved via consensus. The risk of bias assessment was summarized in a "traffic light" figure.

Data analysis

Due to the variability among the included studies, regarding the outcome evaluation and description, reasons for failure could not be statistically compared. Therefore, descriptive statistics (percentages) were used to summarize the outcome.

RESULTS

The PRISMA flow diagram of the systematic review is shown in Figure 1. From the initial 3420 studies identified, 3128 records remained after removing duplicates, and 2674 were removed after the retrieved studies were scanned based on their titles and abstracts because they did not meet the inclusion criteria. The main reasons for not inclusion were that the follow-up time was less than one year. A total of 89 full-text articles were assessed for eligibility criteria, and 34 studies were included in the qualitative analysis. The reasons for the exclusions are described in Figure 1. An inter-examiner agreement was obtained during study selection (Cohen's Kappa, 0.65).

Characteristics of the studies

Most of the included studies compared different root canal filling materials or techniques and were classified as a randomized clinical trial (19 studies)[17-21, 24, 31-34, 39, 41-44,50,53-55] if clearly described in the text or as a clinical trial study based on inherent purpose and design features. Indian researchers conducted thirteen studies,[17,23-28,40,41,43,44,55], brazilian reaearchers conducted three[20,33,53] and researchers from eigth other countries conducted the remaining 17 studies. All studies were published between 2004 and 2022. Approximately 1959 primary molars were treated in 1623 children. The age range of our analytical sample was between two and 13 years old. The exact number of treated teeth, children, and age was unknown, as these data were not clearly described in a few primary studies.

The included studies evaluated pulpectomies using 23 different root canal filling materials. The most used materials for filling root canals were zinc oxide/eugenol based-paste (19 studies) and commercial paste Vitapex (nine studies). In addition, stainless steel crowns were used in 22 studies; eight used composite resin, and five used amalgam as the

restorative material. However, it is essential to consider that more than one restorative material and root canal paste was used in the same study.

Clinical and radiographic assessments were employed in all studies to evaluate the outcome, but only one study[17] used standardized criteria recommended by the American Association of Endodontists. However, the signs and symptoms included in clinical and radiographic assessment varied among the studies. The characteristics of each included study are listed in Table 2.

Failure analysis

Table 3 presents the characteristics of the studies regarding the reasons for failures. The follow-up ranged from 12 (16 studies) to 36 months (three studies). Of 1959 teeth treated, 1603 were considered in the follow-up, ranging from 14[18] to 138.[19] The number of teeth evaluated in the last follow-up was not clearly described in three studies[20-22] two[20,21] of them included anterior and posterior primary teeth at baseline and did not describe the failure separately. Seven studies also did not describe the number of failed pulpectomies.[17,20-25] The percentage of failure of pulpectomies in primary teeth ranged from 0 to 46% approximately. Three studies did not report any failed pulpectomy after 12[26,27] and 18 months[28] of follow-up.

In five studies,[21,24,25,51,52] the reason for failure was classified as clinical and radiographic simultaneously; six studies pointed out that failures were for a radiographic reason, with no clinical failures,[17,18,29,31,37,53] and one study for a clinical reason[32]. Most studies described the failures as being for clinical only, radiographic only, or both.[19,20, 22,23, 25,27,34-36,39-45,49,50,54.] One study did not clearly describe the reason for failure[33] as clinical or radiographic, without any obvious information about the failure evaluation. Two studies did not report failures.[26,278] No study, however, clearly presented the fundamental reason for the failure of pulpectomies in primary molars. In most studies, the failures were described according to clinical and radiographic criteria concurrently; therefore, the reason for failure was not clearly identified in each study. Mobility, pain, sinus tract and swelling were the most described clinical failures, whereas pathological root resorption, furcal radiolucency, and increased radiolucency were the main cited radiographic characteristics. Only one study described failures related to composite resin restoration[31] and another study for stainless steel crown.[34]

Assessment of Risk of bias

The assessment of the quality and risk of bias of the included studies is shown in Figure 2. Fourteen studies[17,19,20,21,23,32,34,35,39,44,50,52-54] were classified as having low risk of bias. No study was classified as having a high risk of bias, although two studies[29,36] had a high risk of bias in the D1 domain (bias arising from the randomization process), and one study[55] in the D3 domain (bias due to missing outcome data).

DISCUSSION

In this systematic review, we provided updates on clinical and radiographic failures of pulpectomies in primary molars. Despite the importance of accurately identifying the failure reasons to improve pulpectomy success, no previous systematic review was performed to clarify it. This systematic review pointed out that there is no absolute consensus regarding the reason for failures of pulpectomies in primary molars due to no accurate description of it in the primary studies. Combined clinical and radiographic causes were described in most studies, whereas mobility, pain, sinus tract, swelling, pathological root resorption, and radiolucences were overall considered the most common factors associated with failure.

It is essential to highlight that some clinical signs and symptoms associated with pulpal necrosis should disappear within a few days or weeks after the pulpectomy. However, radiolucences usually take longer to resolve or to remain stable over time. Thus, we considered a minimum follow-up of one year as inclusion criteria, and most studies have considered exactly this follow-up time. The longest follow-up time was 36 months, but only three studies considered this time.[17,23,35] Nevertheless, one study[31] described only clinical failures after the follow-up. Although the radiographic assessment had been considered evaluation criteria in the Aminabadi et al.[32] study, only failures for clinical reasons were observed, including mobility, root resorption, pain, and sinus tract. In contrast, in five studies[17,18,29,31,37], however, no clinical failures were observed, and the reasons for failures were only radiographic. In three studies, no failures were observed, even after 12[26,27] and, 18 months of follow-up.[28] Besides that, limitations of clinical and radiographic assessments may also contribute to doubtful cases or unclear success in pulpectomy treatment, suggesting long-term follow-up. Therefore, stricter evaluation criteria are suggested for root canal treatment in permanent teeth,[38] and it may also be extrapolated and adapted for pulpectomy in primary teeth. However, it is worth emphasizing that "clinical silence" is not a

secure indicator of success, and a combination of clinical and radiographic assessment is necessary. Moreover, patient-related variables should also be considered.

The overall failure rate of pulpectomies in primary molars was up 46.15%. However, several studies[17,20-23,25] did not clearly describe the exact number of failed pulpectomies, even the number of evaluated teeth at the last follow-up. Thus, the direct comparison of the overall failure rate with previous individual studies may not be possible. Nevertheless, in a previous study, the survival rate for pulpectomies was 62.9% after 12 months of follow-up,[4] and most of the failures occurred in the first three months. Most of the studies included in this systematic review showed lower percentages of failure, except for two, in which the failures were 44%[39] and 46.1%.[40] In all studies that described the percentage of failures separately for clinical reasons from those identified radiographically, the failures for radiographic reasons were superior to the clinical ones.[19,34-36,38,39,42-45] The included studies did not access individual-related variables that can play an essential role in the success or failure of pulpectomy in primary molars.

Adequate tooth restoration is associated with the improved prognosis of endodontic treated permanent teeth[46-48] by minimizing the leakage and bacteria into the periradicular areas. However, in the present systematic review, restorative failures in pulpectomized primary teeth were only described by two studies[32,34]. Therefore, the findings do not align with previous findings in permanent teeth. Besides, the failed composite resin restorations[32] and the loss of stainless steel crown[33] were not considered reasons for pulpectomy failure.

The absence or incomplete description of the parameters considered in assessing the risk of bias was found in almost all included studies. However, only three studies[17,19,35] described the considered items thoroughly. Parameters such as random sequence generation, allocation concealment, blinding of the participants, personnel, and outcome assessment should be clearly described in future studies. Besides that, it may be suggested that the exact number of failed pulpectomies and the reasons for failure be accurately described. Moreover, developing specific criteria for the definition of success/failure as reasons for the failure could also guide clinicians and researchers to improve clinical outcomes of endodontic treatment in primary teeth.

The databases PubMed/MEDLINE, Web of Science, Scielo, Scopus, and Cochrane Library were the only ones considered in our electronic search, which may be a limitation of the study. However, as related in previous systematic reviews,[6,7] other databases and grey literature's impact is unclear, adding more incomplete data. In addition, the inclusion of prospective studies or undefined randomized clinical trials can cause bias in the systematic review. Thus in this study, only clinical trials describing a random allocation of the groups

tested were selected, even though the authors do not consider the criteria for reporting a randomized clinical study (based on CONSORT).

CONCLUSION

Several biological and technical factors can determine the success of pulpectomy in primary teeth, and identifying the reasons for failure could favor the prediction of success. The principal reasons for failure could not be identified in this systematic review. In almost all studies, pulpectomies' failures were assessed by clinical and/or radiographic evaluation. Moreover, incomplete or unclear descriptions of failures were common in primary studies. Thus, it is suggested the need to establish protocols for the follow-up of pulpectomy and specific criteria indicating the reasons for treatment failure.

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Figure legends

Figure 1. Flow diagram of the systematic review.

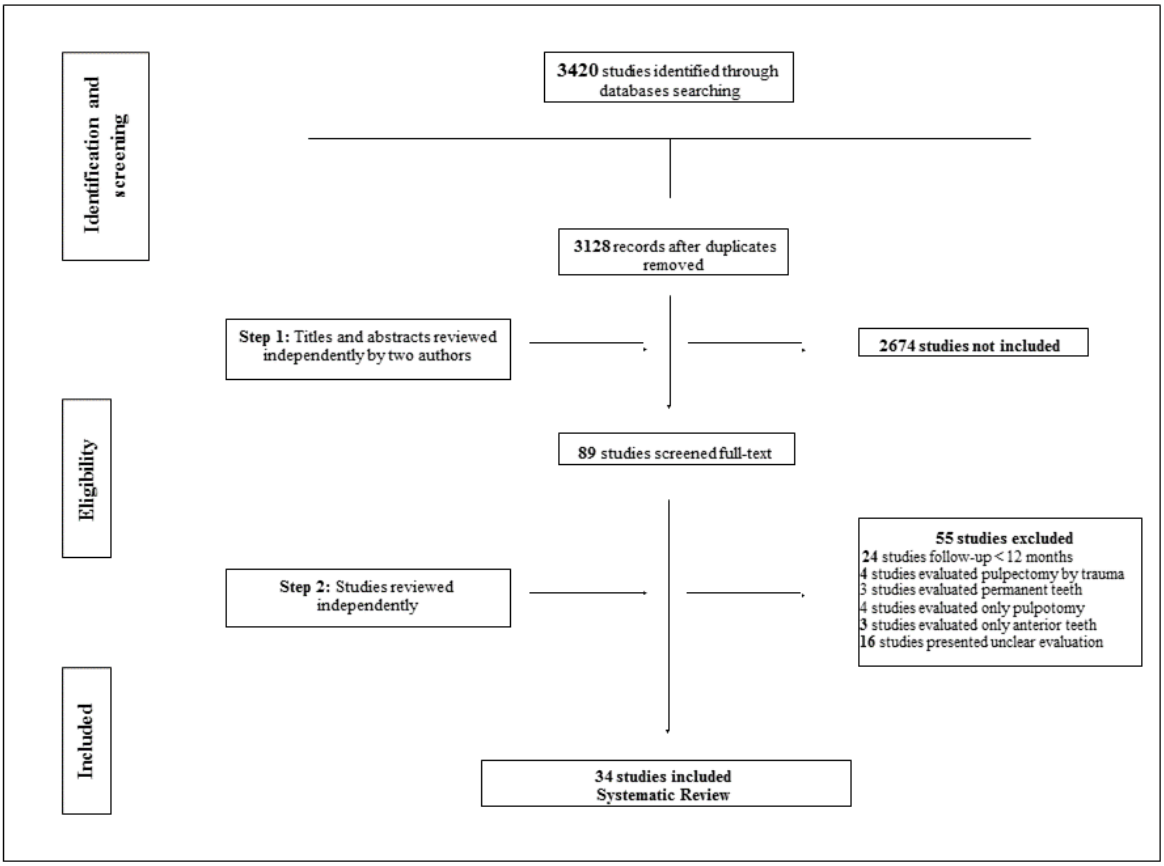

Figure 2. Ascertainment of the risk of bias in the included studies.

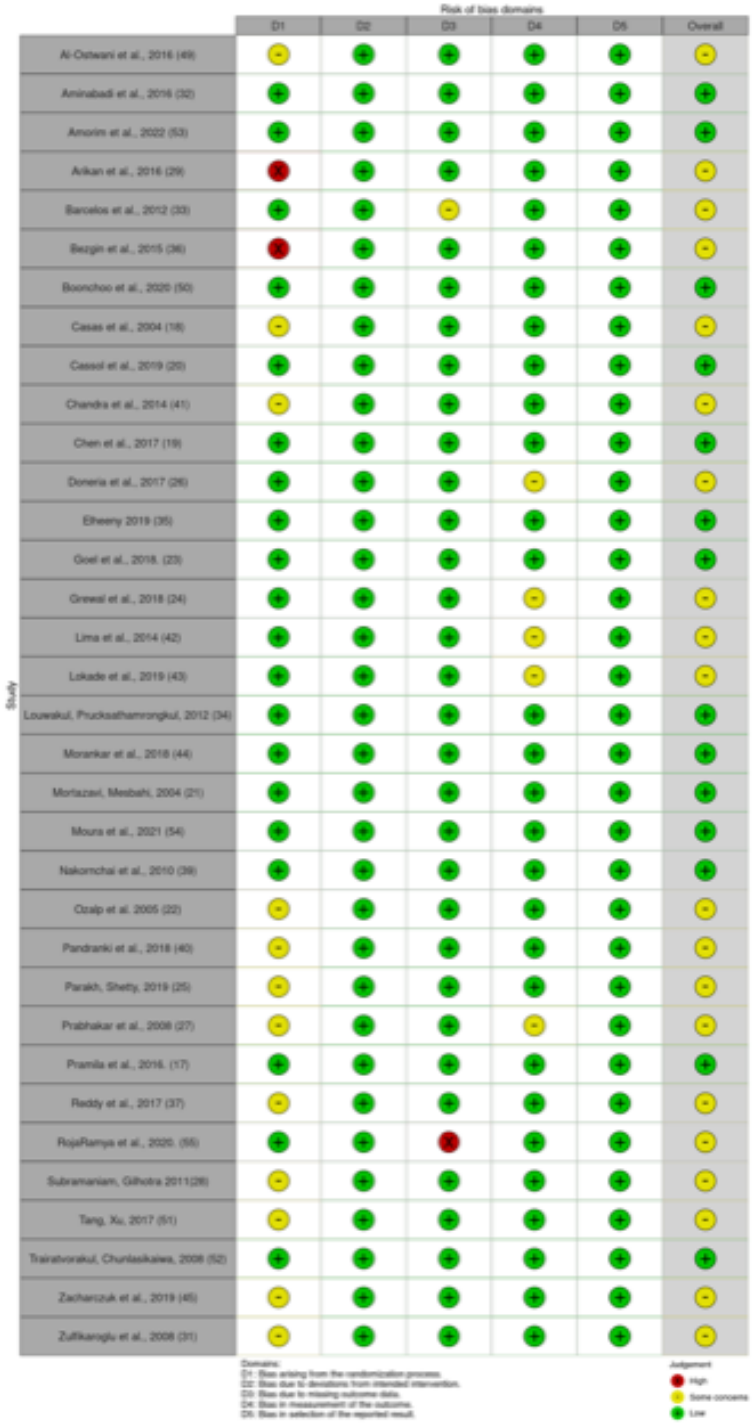

Table 1 - Structured search strategy carried out in MEDLINE/PubMed database.

SEARCH	TOPIC AND TERMS
#4	Search #1 AND #2 AND #3
#3	Pulpectomies: “(pulpectomy[MeSH Terms]) OR pulpectom*) OR root canal therapy[MeSH Terms]) OR root canal therap*) OR endodontics[MeSH Terms]) OR endodontic*) OR root canal preparation[MeSH Terms]) OR root canal preparat*) OR root canal obturation[MeSH Terms]) OR root canal obturat*) OR pulpitis[MeSH Terms]) OR pulpit*) OR dental pulp disease[MeSH Terms]) OR dental pulp disease*) OR necrosis[MeSH Terms]) OR necros*) OR root canal treatment”
#2	Primary teeth: “(tooth, deciduous[MeSH Terms]) OR deciduous tooth) OR dentition*, deciduous) OR deciduous dentition*) OR dentition*, primary) OR primary dentition*) OR milk tooth) OR tooth, milk) OR primary teeth) OR teeth, deciduous) OR deciduous teeth) OR teeth, primary) OR tooth primary) OR milk teeth) OR teeth, milk) OR baby teeth) OR teeth, baby) OR baby tooth) OR tooth, baby) OR primary tooth”
#1	Randomizel Clinical Trial: “randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized controlled trials [mh] OR random allocation [mh] OR double-blind method [mh] OR single-blind method [mh] OR clinical trial [pt] OR clinical trials[mh] OR (“clinical trial”[tw]) OR ((singl*[tw] OR doubl*[tw] OR trebl*[tw] OR tripl*[tw]) AND (mask*[tw] OR blind*[tw])) OR (placebos [mh] OR placebo* [tw] OR random* [tw] OR research design [mh:noexp] OR comparative study [pt] OR evaluation studies as topic [mh] OR follow-up studies [mh] OR prospective studies [mh] OR control* [tw] OR prospective* [tw] OR volunteer* [tw]) NOT (animals [mh] NOT humans [mh])”

Table 2. Clinical trials evaluating pulpectomies in primary teeth

Author, year	Country[@]	Aim	Study design	Participants (age in years)	Teeth at baseline	Rubber dam	Filling material	Restoration material	Evaluation criteria
Al-Ostwani et al., 2016[49]	Syria	To evaluate four different root canal filling pastes	CT	39 (3 - 9)	64	Yes	zinc oxide/propolis Endoflass Metapex zinc oxide/eugenol	stainless steel crown	Clinical: abnormal mobility, pain, or sensitivity to percussion. Radiographic: size of radiolucency and bone regeneration.
Aminabadi et al., 2016[32]	Iran	To compare antibiotics to MTA on the repair of bony defects	RCT	65 (3 - 6)	80	Yes	zinc oxide/eugenol	stainless steel crown glass ionomer cement (GIC) GIC-reinforced amalgam composite resin	Clinical: sinus tract,pain, and pathologic tooth mobility. Radiographic: expanding periapical or furcation radiolucency
Amorim et al., 2022[53]	Brazil	To compare instrumentation time and filling quality between manual (k-file) and rotary (Hyflex	RCT	40 (4-11)	40	Yes	calcium hydroxide/zinc oxide (Calen®/ZO)	Resin-modified glass ionomer cement	Clinical: pain, fistula or abscess, pathological mobility, and sensitivity to percussion. Radiograph: presence of a radiolucent inter-radicular area, the periodontal ligament condition, and the

		EDM®) files							presence of periapical lesion
Arikan et al., 2016[29]	Turkey	To compare MTA with IRM for the coating of pulpal floor following root canal treatment	CT	50 (4 - 9)	50	Yes	calcium hydroxide/iodoform	stainless steel crown	Clinical: pain, pathological mobility, tenderness to percussion and palpation, soft tissue pathology, sinus tract. Radiographic: pathological root resorption, new lesions at the interradicular or periapical area.
Barcelos et al., 2012[33]	Brazil	The effect of smear layer removal on pulpectomy outcome	RCT	48 (2 - 9)	23	Yes	zinc oxide/eugenol	glass ionomer cement composite resin preformed metal crown	Clinical: pain, swelling, fistula, sensitivity to percussion. Radiographic: reduction in the size of the radiolucent area and no newly radiolucency.

Bezgin et al., 2015[36]	Turkey	To compare MTA and gutta-percha/AH-Plus as root canal filling material	CT	16 (6 - 13)	20	Yes	mineral trioxide aggregate gutta-percha/ AH-Plus	composite resin	Clinical: pain, tenderness to percussion, swelling, and presence of a fistula or pathological mobility. Radiographic: no evidence of periradicular or interradicular radiolucency or internal or external roots resorption. Resolution or arrest were also considered successful.
Boonchoo et al., 2020[50]	Thailand	To evaluate the effectiveness of sNiTi compared to that of SSH in primary tooth pulpectomy	RCT	41 (3-7)	46	Yes	Vitapex ™	stainless steel crown	Clinical: no symptoms, tooth mobility, swelling, sinus tracts, or pus exudates. Radiographic: size of radiolucency area, visible lamina dura and root resorption

Casas et al., 2004[18]	Canada	To compare pulpotomy and root canal therapy	RCT	54 (unclear)*	109	Yes	zinc oxide/eugenol	stainless steel crown	Clinical: pain, restoration; recurrent caries lesions; mobility; and percussion sensitivity, erythema, swelling, parulis, or fistulous tract. Radiographic: evaluation of periodontal ligament space, furcation or periapical radiolucency, pulp canal obliteration, and pathologic internal or external root resorption.
Cassol et al., 2019[20]	Brazil	To evaluate two different root canal filling pastes	RCT	Unclear	7	Yes	iodoform paste calcium hydroxide/zinc oxide (Calen®/ZO)	composite resin	Clinical: pain, swelling, fistula, or sensitivity to percussion. Radiographic: size of the previous radiolucent area, or no new radiolucency
Chandra et al., 2014[41]	India	To evaluate the mixture of ozonated oil and zinc oxide as root filling material	RCT	52 (3 - 7)	60	Yes	ozonated oil /zinc oxide zinc oxide/eugenol	stainless steel crown	Clinical: absence of pain, tenderness to percussion, absence or decrease in mobility and sinus opening. Radiographic: resolution in the radiolucency, no new signs of post-operative radiolucency, internal or external pathological root resorption.

Chen et al., 2017[19]	China	To evaluate filling materials and to compare the resorption rates	RCT	155 (4 - 9)	160	Yes	zinc oxide/ iodoform/calcium hydroxide zinc oxide/eugenol calcium hydroxide/iodoform	composite resin	Clinical: pain, gingival abscesses, fistula openings, and abnormal mobility. Radiographic: pathologic external root resorption and no radiographic lesions.
Doneria et al., 2017[26]	India	To compare three root canal filling materials.	CT	43 (4-8)	40	Yes	zinc oxide/ozonated oil Vitapex	stainless steel crown	Clinical:pain, presence of healthy soft tissue and mobility. Radiographic: size of interradicular radiolucency, bone regeneration/continuity of lamina dura and internal/external resorption.
Elheeny 2019[35]	Egypt	To evaluate intracanal irrigants	CT	90 (4 - 6)	110	Yes	zinc oxide/eugenol	stainless steel crown amalgam	Clinical: pain, swelling, fistulous tract, mobility. Radiographic: root resorption, persistent radiolucency at the furcation area or increase of the periapical and/or furcational radiolucency

Goel et al., 2018[23]	India	To compare four root canal obturating materials	CT	120 (4 - 9)	120	Yes	zinc oxide/eugenol zinc oxide/sodium fluoride zinc oxide/aloe vera Endoflass	stainless steel crown	Clinical: pain, swelling, tenderness on percussion, sinus or fistula, mobility. Radiographic: periapical or interradicular pathology, internal or pathological external root resorption, interradicular radiolucencies, no bone regeneration, discontinuity of lamina dura.
Grewal et al., 2018[24]	India	To evaluate the root resorption rate of endodontically treated teeth	RCT	25 (7 - 10)	25	Yes	calcium hydroxide/iodoform	stainless steel crown	Clinical: pain, discomfort, gingival inflammation, swelling, sinus. Radiographic: root length compared with the contralateral healthy tooth
Lima et al., 2013[42]	Brazil	To compare two treatments against mutans streptococci and anaerobic bacteria	RCT	21 (4 - 8)	37	Yes	zinc oxide/eugenol	stainless steel crown	Clinical: fistula, gingival abscess, mobility. Radiographic: pathologic interradicular or periapical radiolucency, pathologic external or internal root resorption.

Lokade et al., 2019[43]	India	To evaluate three tissue repair therapies	RCT	50 (4 - 8)	21[&]	Yes	3Mix antibiotic paste	stainless steel crown	Clinical: pain, unhealthy soft tissue, mobility. Radiographic: increase in the size of intra-radicular radiolucency, no bone regeneration/discontinuity of lamina dura, internal external resorption.
Louwakul, Prucksathamrongkul, 2012[34]	Thailand	To evaluate two irrigant solutions on the outcome of primary molar pulpectomies.	RCT	42 (3-9)	64	Yes	Vitapex	stainless steel crown	Clinical: pain, swelling or sinus tract and mobility. Radiographic: modification of the criteria from Molander and colleagues.
Morankar et al., 2018[34]	India	To compare manual and rotary canal instrumentation	RCT	60 (4 - 7)	60	Yes	calcium hydroxide/zinc oxide	stainless steel crown	Clinical: pain, tenderness to percussion, gingival swelling, sinus tract formation, or abnormal tooth mobility. Radiographic: increase or development of radiolucency or pathologic root resorption.
Mortazavi, Mesbahi, 2004[21]	Iran	To compare materials for root canal treatment	RCT	58 (3 - 13)	58[$]	?	zinc oxide/eugenol Vitapex	amalgam	Clinical: pain, fistula, intraoral swelling, extraoral swelling or abnormal mobility. Radiographic: no reduction or newly formed radiolucency.

Moura et al., 2021[54]	Brazil	To compare lesion sterilization and tissue repair (LSTR), antibiotic paste, and zinc oxide and eugenol (CTZ) versus zinc oxide eugenol (ZOE)	RCT	70 (Mean age 5.5)	44**	Yes	zinc oxide eugenol	high-viscous glass ionomer	Clinical: absence of sinus tract/swelling and/or exfoliation before six months Radiographic: absence, decrease or disappearance of the radiolucent area, and no new radiolucency
Nakornchai et al., 2010[39]	Thailand	To compare materials for root canal treatment	RCT	37 (3 - 8)	25[$]	Yes	Vitapex	stainless steel crown	Clinical: pain, gingival abscesses, fistula openings, or abnormal mobility Radiographic: size of bifurcation⁄periapical radiolucency, external or internal root resorption
Ozalp et al., 2005[22]	Turkey	To compare four root canal obturating materials	CT	76 (4 - 9)	80	?	zinc oxide/eugenol Calcicur Sealapex Vitapex	amalgam	Clinical: pain, gingival swelling, tenderness to percussion, mobility, fistula or abscess. Radiographic: furcation or periapical radiolucency, discontinuity of lamina dura, pathologic root resorption.

Pandranki et al., 2018[40]	India	To evaluate and compare the success of endoflas as root canal filling material in infected primary molars with zinc oxide eugenol (ZOE).	CT	44 (4-9)	60	Yes	Endoflas zinc oxide/eugenol	stainless steel crown composite resin	Clinical: pain, tenderness,abscess, and decrease or absence of mobility. Radiographic: size of interradicular radiolucency and internal or external pathological root resorption
Parakh, Shetty, 2019[25]	India	To evaluate GAM (gentamicin/amoxicillin/metronidazole) antibiotic paste	CT	60 (4 - 8)	30$	Yes	GAM paste (gentamycin, amoxicillin and metronidazole)	stainless steel crown	Clinical: pain, swelling, sinus/fistula, abnormal mobility, exfoliation. Radiographic: radicular pathology
Prabhakar et al., 2008[27]	India	To evaluate a combination of antibacterial drugs	CT	41 (4 - 10)	30$	Yes	Antibacterial mix - ciprofloxacin, metronidazole, and	composite resin	Clinical: pain, tenderness to percussion, abnormal mobility and signs of pathology like intraoral and/or extraoral abscess. Radiographic: increase in the radiolucency

							minocycline.		
Pramila et al., 2016[17]	India	To evaluate three root canal filling Materials	RCT	88 (4 - 9)	129	Yes	Vitapex RC Fill Pulpdent	stainless steel crown	Modified American Association of Endodontists criteria
Reddy et al., 2017[37]	India	To evaluate a 3MIX-MP as an intracanal medicament before the obturation	CT	55 (4 - 10)	60	Yes	zinc oxide/eugenol	stainless steel crown	Clinical: pain, presence of swelling, sinus tract, and mobility. Radiographic: increase in furcation radiolucency or development of root resorption which is abnormal for the age.
RojaRamja et al., 2020[55]	India	To compare the clinical effectiveness of zinc oxide-propolis mixture with zinc oxide eugenol (ZOE)	RCT	40 (4-8)	40	Yes	zinc oxide-propolis mixture and zinc oxide paste	stainless steel crown	Clinical: apain, no tenderness to percussion, mobility and sinus opening Radiographic: radiolucency, no signs of internal or external pathological root resorption

Subramaniam, Gilhotra, 2011[28]	India	To evaluate of Endoflas, zinc oxide eugenol and Metapex as root canal filling materials	CT	not described (5 - 9)	45	Yes	zinc oxide/eugenol Endoflass Metapex	stainless steel crown	Clinical: gingival swelling/inflammation/redness, sinus or purulent exudate, mobility, and pain on percussion/tenderness. Radiographic: pathologic root resorption, pathologic interradicular and/or periapical radiolucency, pathologic radiolucency involving the succedaneous tooth germ.
Tang, Xu, 2017[51]]	China	To evaluate the effects of pulpectomy on teeth with deep caries	CT	unclear[#] (3 - 8)	91	No	Vitapex	composite resin	Clinical: pain, percussion pain, swelling or fistula. Radiographic: periodontal ligament widening, shadows of root furcation and root tip, root canal calcification, and root canal absorptions.
Trairatvorakul, Chunlasikaiwa, 2008[52]	Thailand	To compare zinc oxide-eugenol cement vs Vitapex	CT	42 (3 - 7)	54	Yes	zinc oxide/eugenol Vitapex	stainless steel crown	Clinical: pain, swelling, redness or sinus tract, mobility. Radiographic: discontinuity of the lamina dura, inter-radicular and/or periapical radiolucencies.

Zacharczuk et al., 2019[45]	Argentina	To compare pulp treatment with 3MixMP and pulpectomy with MaistoCapurro *paste*	CT	Unclear	23	Yes	Maisto-Capurro paste	stainless steel crown	Clinical: pain or sensitivity to percussion and palpation, swelling, fistula and non physiologica mobility. Radiographic: internal or external nonphysiologicalresorption, size of radiolucent periapical/interradicular lesion.
Zulfikaroglu et al., 2008[31]	Turkey	To investigate the success rate of adhesively restored pulpectomized teeth	RCT	51 (4 - 9)	75	?	Calcicur	amalgam composite resin compomer	Clinical: parulis, and excessive mobility. Radiographic: periapical and/or inter-radicular radiolucency; internal and/or external root resorption; and pathological root resorption.

[@] Country of the first author.
? Unclear
[%] The study included also 49 anterior teeth.
*** The average age was 4.8 years±1.1.**
[&] The study included 63 teeth; 21 teeth were submitted to pulpectomy.
**** Only pulpectomized teeth were considered.**
[$] The study included anterior teeth.
[#] The study included 124 children and 192 molars divides into pulpotomy group (not considered in this systematic review) and pulpectomy group.
RCT – Randomized Clinical Trial
CT – Clinical Trial

Table 3. Reasons for failure in pulpectomies by included studies.

Author, year	Follow-up (months)	Teeth at the last follow-up	Failure (number of teeth)	Overall Failures (%)	Reason for failure	Considerations
Al-Ostwani et al., 2016[49]	12	57	0 8	14.04	Clinical Radiographic	7 teeth were extracted at 12 months follow-up 5 teeth were considered radiographically as suspect
Aminabadi et al., 2016[32]	24	69	18	26.09	Clinical	Mobility and root resorption, pain, and sinus tract 1 tooth presented furcal rarefaction, it was not considered as failure 2 composite resin restorations failed
Amorim et al., 2022[53]	12	24	5	16.7	Radiographic	Periapical injury, radiolucent area, periodontal ligament without integrity
Arikan et al., 2016[29]	18	50	15	30.00	Radiographic	Unclear
Barcelos et al., 2012[33]	24	22	4	18.18	Unclear	Unclear
Bezgin et al., 2015[36]	36	20	3 6	15.00 30.00	Clinical and radiographic Radiographic	Clinical failure were related to swelling Radiographic failure included pathological root resorption and new furcal and/or periapical lesions
Boonchoo et al., 2020[50]	12	37	0 9	24.32	Clinical Radiographic	Unclear
Casas et al., 2004[18]	36	14	4	28.57	Radiographic	Unclear
Cassol et al., 2019[20]	12	Unclear	Unclear	Unclear	Clinical Radiographic	Unclear
Chandra et al., 2014[41]	12	60	1 11	1.67 18.33	Clinical Radiographic	Unclear
Chen et al., 2017[19]	18	138	22 36	15.94 26.09	Clinical Radiographic	Unclear
Doneria et al., 2017[26]	12	40	0	No failures	No failures	No failures

Elheeny 2019[35]	12	110	19 21	 17.27 19.09	Clinical Radiographic	Mobility (20 teeth), gingival swelling (17 teeth) fistulous tract formation (16 teeth), and pain (11 teeth) Pathological root resorption (21 teeth), increase radiolucency (12 teeth), and persistent radiolucency (13 teeth)
Goel et al., 2018[23]	12	90	Unclear*	Unclear	Clinical Radiographic	Pain (2 teeth), sinus (4 teeth), and tenderness on percussion (2 teeth) Increase of radiolucency
Grewal et al., 2018[24]	36	15	Unclear*	Unclear	Clinical and radiographic	Bone resorption around the crown of succedaneous teeth and their delayed eruption
Lima et al., 2013[41]	12	37	4 7	10.81 18.92	Clinical Radiographic	Mobility (3 teeth), and pain (1 tooth) Persistence of radiolucency (6 teeth), and external root resorption (3 teeth)
Lokade et al., 2019[43]	12	21	2 5	9.52 23.81	Clinical Radiographic	Pain, gingival swelling and/or sinus tract (2 teeth) Periodontal ligament enlargement and/or increase in interradicular radiolucency (5 teeth), discontinuity of lamina dura (5 teeth), internal resorption (3 teeth)
Louwakul, Prucksathamrongkul, 2012[34]	18	60	1 3	 1.67 5.00	Clinical Radiographic	One tooth was excluded at 18 months due to loss of the stainless steel crown and temporary filling
Morankar et al., 2018[34]	24	53	6 18	11.32 33.96	Clinical Radiographic	Unclear
Mortazavi, Mesbahi, 2004[21]	10-16	Unclear	Unclear*	Unclear	Clinical and radiographic	Abnormal mobility, improvement in bone radiolucency.
Moura et al., 2021[54]	12	44	4 12	27.3	Clinical Radiographic	Gingival swelling Furcation lesion, radiolucent area increased.
Nakornchai et al., 2010[39]	12	25	1 11	4.00 44.00	Clinical Radiographic	Spontaneous pain, gingival swelling and/or pain to percussion. Bifurcation

						and/or periapical radiolucency, and /or external resorption
Ozalp et al., 2005[22]	18	Unclear	Unclear*	Unclear	Clinical Radiographic	Clinical failures (6 teeth) and radiographic failures (6 teeth). 6 teeth were re-treated before the last follow-up and were not considered as failure
Pandranki et al., 2018[40]	24	52	15 24	28.85 46.15	Clinical Radiographic	Pain, tenderness on percussion, abscess, sinus, erythema, pathological mobility, periradicular pathology.
Parakh, Shetty, 2019[25]	12	29	Unclear*	Unclear	Clinical Radiographic	Swelling (1 tooth) Discontinuous lamina dura, internal root resorption, furcation radiolucency
Prabhakar et al., 2008[27]	12	30	0	0.00	Clinical Radiographic	No failures.
Pramila et al., 2016[17]	30	90	Unclear*	Unclear	Radiographic	No clinical failures. 3 teeth with unchanged pathosis which fulfilled neither success nor failure criteria were considered uncertain (observe)
Reddy et al., 2017[37]	12	54	11	20.37	Radiographic	No clinical failures Increase in bone loss
RojaRamya et al., 2020[55]	24	35	7	30 and 5	No reported	No reported
Subramaniam, Gilhotra, 2011[28]	18	43	0	No failures	No failures	No failures
Tang, Xu, 2017[51]	18	72	19	26.39	Clinical and radiographic	Occlusion discomfort, gingival fistula, periodontal ligament widening, root canal calcification, shadows of root furcation and root tip, and root canal adsorptions
Trairatvorakul, Chunlasikaiwa, 2008[52]	12	54	6	11.11	Clinical and radiographic	Mobility (3 teeth) Furcation involvement
Zacharczuk et al., 2019[45]	18	18	2 3	11.11 16.67	Clinical Radiographic	Unclear

Zulfikaroglu et al., 2008[31]	12	75	12	16.00	Radiographic	Interradicular or periradicular radiolucency, internal/external root resorption, pathological root resorption

*** The study only described as percentage.**

4. CONCLUSÃO

Com base nos estudos presentes nessa tese, a respeito de técnicas minimamente invasivas e invasivas para tratamentos de dentes decíduos, pode-se concluir que:

- O ensino e uso do DFP, em Faculdades de Odontologia no Brasil não sofreu impacto pela pandemia da COVID-19. Mas seu tema continuará sendo abordado nas faculdades brasileiras;
- Diversos fatores biológicos e técnicos podem determinar o sucesso da pulpectomia em dentes decíduos, e identificar os motivos do insucesso pode favorecer a predição do sucesso. Porém, as principais razões para o insucesso não puderam ser identificadas na revisão sistemática devido a descrições incompletas ou pouco claras de falhas os estudos analisados;
- Além disso, através da revisão sistemática de literatura, conclui-se que, são necessários mais estudos de longo tempo de acompanhamento e análises mais detalhadas para identificar as principais razões de falhas das pulpectomias de molares decíduos, visando um melhor prognóstico e sobrevida dos dentes decíduos ao longo do desenvolvimento da criança, buscando a manutenção de suas funções.

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CUNHA, C.B.C.S., BARCELOS, R., PRIMO, L.G. Soluções Irrigadoras e Materiais Obturadores utilizados na terapia endodôntica de dentes decíduos. **Pesq Bras Odontoped Clín Integr**, João Pessoa, vol. 5, n. 1, p. 75-83, jan./abr. 2005.

FROHLICH, T. T., LEITE, T. C., ROCHA R. O. R., Teaching and use of silver diamine fluoride in Pediatric Dentistry: a questionnaire-based cross-sectional analysis of undergraduate Brazilian dental schools. **Rev. ABENO**. vol. 22, n. 2, 2022

SLAYTON R.L. et al. Evidence-based clinical practice guideline on nonrestorative treatments for carious lesions: A report from the American Dental Association. **Journal of American Dental Association**, v. 149, n. 10, p. 837-849.e19, 2018.

TEDESCO, T.K. et al. Scientific evidence for the management of dentin caries lesions in pediatric dentistry: A systematic review and network meta-analysis. **PLoS One**. v.13, n.11, p. 1-20, 2018.

WRIGHT, J.T., WHITE, A. Silver diamine fluoride: changing the caries management paradigm and potential societal impact. **NC Med J.** vol 78, n. 6, p. 394-397, 2017

ANEXO A – NORMAS PARA PUBLICAÇÃO NO PERIÓDICO BRAZILIAN ORAL RESEARCH

As normas para submissão de artigo na revista Brazilian Oral Research são descritas no website: https://www.scielo.br/journal/bor/about/#instructions.

Abaixo está a cópia dessas normas.

Instruções aos autores

Missão, escopo e política de submissão

A *Brazilian Oral Research* – BOR (versão online ISSN 1807-3107) é a publicação oficial da Sociedade Brasileira de Pesquisa Odontológica – SBPqO (Divisão brasileira da *International Association for Dental Research* – IADR). A revista tem classificação A2 Qualis Capes (Odontologia), Fator de Impacto™/2018/2019 1,508 (Institute for Scientific Information – ISI), é revisada por pares (sistema duplo-cego) e tem como missão disseminar e promover o intercâmbio de informações sobre as diversas áreas da pesquisa odontológica e com acesso aberto, modalidade dourada, sem embargo.

A **BOR** aceita submissão dos seguintes tipos de artigos originais e de revisão, nas seguintes tipologias: Pesquisa Original (artigo completo ou *Short Communication*), Revisão Sistemática (e Meta-Análise), além de Cartas ao Editor. Todas as submissões deverão ser exclusivas à BOR.

As revisões críticas de literatura são artigos escritos à convite do editor.

A submissão dos manuscritos, e de toda documentação relacionada, deve ser realizada exclusivamente pelo ScholarOne Manuscripts™, através do link de submissão online.

O processo de avaliação do conteúdo científico do manuscrito será iniciado somente após o atendimento dos requisitos descritos nestas Instruções aos Autores. O manuscrito em

desacordo com estes requisitos será devolvido ao autor de correspondência para adequações.

Importante: Após ser aceito por seu mérito científico, todo manuscrito deverá ser submetido a uma revisão gramatical e estilística do idioma inglês. Para conhecer as empresas recomendas, entre em contado com bor@sbpqo.org.br. Os autores deverão encaminhar o texto revisado juntamente com o certificado de revisão fornecido pela empresa de edição escolhida. **Não serão aceitas revisões linguísticas realizadas por empresas que não estejam entre as indicadas pela BOR.**

Apresentação do manuscrito

O texto do manuscrito deverá estar redigido em inglês e fornecido em arquivo digital compatível com o programa "Microsoft Word" (em formato DOC, DOCX ou RTF).

Cada uma das figuras (inclusive as que compõem esquemas/combos) deverá ser fornecida em arquivo individual e separado, conforme as recomendações descritas em tópico específico.

Fotografias, micrografias e radiografias deverão ser fornecidas em formato TIFF, conforme as recomendações descritas em tópico específico.

Gráficos, desenhos, esquemas e demais ilustrações vetoriais deverão ser fornecidos em formato PDF, em arquivo individual e separado, conforme as recomendações descritas em tópico específico.

Arquivos de vídeo poderão ser submetidos, respeitando as demais especificidades, inclusive o anonimato dos autores (para fins de avaliação) e respeito aos direitos dos pacientes.

Importante: o ScholarOne™ permite que o conjunto dos arquivos somem no máximo 10 MB. No caso de a inclusão do arquivo de vídeo acarretar em tamanho superior, é possível informar o link de acesso ao vídeo. Na reprodução de documentação clínica, o uso de iniciais, nomes e/ou números de registro de pacientes são proibidos. A identificação de pacientes não é permitida. Um termo de consentimento esclarecido, assinado pelo paciente, quanto ao uso de sua imagem deverá ser fornecido pelo(s) autor(es) quando solicitado pela **BOR**. Ao reproduzir no manuscrito algum material previamente publicado (incluindo textos, gráficos, tabelas, figuras ou quaisquer outros materiais), a legislação cabível de Direitos Autorais deverá ser respeitada e a fonte

citada.

As seções do manuscrito devem ser apresentadas observando-se as características específicas de cada tipo de manuscrito: folha de rosto (*Title Page*), introdução, metodologia, resultados, discussão, conclusão, agradecimentos e referências.

Folha de rosto (*Title Page*; dados obrigatórios)

- Indicação da área temática da pesquisa enfocada no manuscrito.
- Áreas Temáticas: Anatomia; Biologia Craniofacial; Biologia Pulpar; Bioquímica; Cariologia; Ciências do Comportamento; Cirurgia Bucomaxilo; Controle de Infecção; Dentística; Disfunção Temporomandibular; Estomatologia; Farmacologia; Fisiologia; Imaginologia; Implantodontia - Clínica Cirúrgica; Implantodontia - Clínica Protética; Implantodontia Básica e Biomateriais; Imunologia; Materiais Dentários; Microbiologia; Oclusão; Odontogeriatria; Odontologia Legal; Odontologia Social; Odontopediatria; Ortodontia; Ortopedia; Patologia Oral; Periodontia; Prótese; Saúde Coletiva; Terapia Endodôntica.
- Título informativo e conciso, limitado a um máximo de 110 caracteres incluindo espaços.
- Nomes completos e por extenso de todos os autores, incluindo os respectivos e-mails e ORCID.

Recomenda-se aos autores confrontar seus nomes anotados na Folha de Rosto (*Title Page*) com o perfil criado no ScholarOne™, de modo a evitar incompatibilidades.

- Dados de afiliação institucional/profissional de todos os autores, incluindo universidade (ou outra instituição), faculdade/curso em inglês, departamento em inglês, cidade, estado e país. **Só é aceita uma afiliação por autor**. Verificar

se as afiliações foram inseridas corretamente no ScholarOne™.

Texto Principal

Resumo: deve ser apresentado na forma de um parágrafo único estruturado (sem sub-divisões em seções), contendo objetivo, metodologia, resultados e conclusões. No Sistema, utilizar a ferramenta *Special characters* para caracteres especiais, se aplicável.

Descritores: devem ser fornecidos de 3 (três) a 5 (cinco) descritores principais, escolhidos dentre os descritores cadastrados em https://meshb.nlm.nih.gov/search (não serão aceitos sinônimos).

Introdução: deve apresentar o estado da arte do assunto pesquisado, a relevância do estudo e sua relação com outros trabalhos publicados na mesma linha de pesquisa ou área, identificando suas limitações e possíveis vieses. O objetivo do estudo deve ser apresentado concisamente ao final dessa seção.

Metodologia: devem ser fornecidas todas as características do material pertinente ao assunto da pesquisa (ex.: amostras de tecido, sujeitos da pesquisa). Os métodos experimentais, analíticos e estatísticos devem ser descritos de forma concisa, porém suficientemente detalhada para permitir que outros possam repetir o trabalho. Os dados de fabricantes ou fornecedores de produtos, equipamentos, ou softwares devem ser explicitados na primeira menção feita nesta seção, como segue: nome do fabricante, cidade e país. Os programas de computador e métodos estatísticos também devem ser especificados. A menos que o objetivo do trabalho seja comparar produtos ou sistemas específicos, os nomes comerciais de técnicas, bem como de produtos ou

equipamentos científicos ou clínicos só devem ser citados nas seções de "Metodologia" e "Agradecimentos", de acordo com o caso. No restante do manuscrito, inclusive no título, devem ser utilizados os nomes genéricos. Nos manuscritos que envolvam radiografias, microrradiografias ou imagens de MEV, devem ser incluídas as seguintes informações: fonte de radiação, filtros e níveis de kV utilizados. Os manuscritos que relatem estudos em humanos devem incluir comprovação de que a pesquisa foi conduzida eticamente de acordo com a Declaração de Helsinki (*World Medical Association*). O número de protocolo de aprovação emitido por um Comitê Institucional de Ética deve ser citado. Estudos observacionais devem seguir as diretrizes STROBE e o check list deve ser submetido. Ensaios clínicos devem ser relatados de acordo com o protocolo padronizado da *CONSORT Statement*, revisões sistemáticas e meta-análises devem seguir o PRISMA, ou Cochrane.

Ensaios Clínicos

Os ensaios clínicos segundo as diretrizes CONSORT. O número de registro do ensaio clínico e o nome do registro da pesquisa serão publicados com o artigo.

Manuscritos que relatem a realização de estudos em animais devem também incluir comprovação de que a pesquisa foi conduzida de maneira ética, e o número de protocolo de aprovação emitido por um Comitê Institucional de Ética deve ser citado. Caso a pesquisa envolva um registro gênico, antes da submissão, as novas sequências genéticas devem ser incluídas num banco de dados público, e o número de acesso deve ser fornecido à **BOR**. Os autores poderão utilizar as seguintes bases de dados:

- GenBank

- EMBL
- DDBJ

As submissões de manuscritos que incluam dados de *microarray* devem incluir a informação recomendada pelas diretrizes MIAME (*Minimum Information About a Microarray Experiment*) e/ou descrever, na forma de itens, como os detalhes experimentais foram submetidos a uma das bases de dados publicamente disponíveis, tais como:

- ArrayExpress
- GEO

Resultados: devem ser apresentados na mesma ordem em que o experimento foi realizado, conforme descrito na seção "Metodologia". Os resultados mais significativos devem serdescritos. Texto, tabelas e figuras não devem ser repetitivos. Os resultados com significância estatística devem vir acompanhados dos respectivos valores de p.

Tabelas: devem ser numeradas e citadas consecutivamente no texto principal, em algarismos arábicos. As tabelas devem ser submetidas separadamente do texto em formato DOC, DOCX ou XLS (podem estar reunidas em um único arquivo).

Discussão: deve discutir os resultados do estudo em relação à hipótese de trabalho e à literatura pertinente. Deve descrever as semelhanças e as diferenças do estudo em relação aos outros estudos correlatos encontrados na literatura, e fornecer explicações para as possíveis diferenças encontradas. Deve também identificar as limitações do estudo e fazer sugestões para pesquisas futuras.

Conclusões: devem ser apresentadas concisamente e estar estritamente fundamentadas nos resultados obtidos na pesquisa. O detalhamento dos resultados, incluindo valores

numéricos etc., não deve ser repetido.

Agradecimentos: as contribuições de colegas (por assistência técnica, comentários críticos etc.) devem ser informadas, e qualquer vinculação de autores com firmas comerciais deve ser revelada. Esta seção deve descrever a(s) fonte(s) de financiamento da pesquisa, incluindo os respectivos números de processo.

Referências: só serão aceitas como referências as publicações em periódicos revisados por pares.

As citações de referências devem ser identificadas no texto por meio de números arábicos sobrescritos. A lista completa de referências deve vir após a seção de "Agradecimentos", e as referências devem ser numeradas e apresentadas de acordo com o Estilo Vancouver, em conformidade com as diretrizes fornecidas pelo *International Committee of Medical Journal Editors*, conforme apresentadas em *Uniform Requirements for Manuscripts Submitted to Biomedical Journals*. Os títulos de periódicos devem ser abreviados de acordo com o *List of Journals Indexed in Index Medicus*. A correta apresentação das referências é de responsabilidade exclusiva dos autores.

Grafia de termos científicos: nomes científicos (binômios de nomenclatura microbiológica, zoológica e botânica) devem ser escritos por extenso, bem como os nomes de compostos e elementos químicos, na primeira menção no texto principal.

Unidades de medida: devem ser apresentadas de acordo com o Sistema Internacional de Medidas (http://www.bipm.org ou http://www.inmetro.gov.br/consumidor/unidLegaisMed.asp).

Notas de rodapé no texto principal: devem ser indicadas por meio de asteriscos e restritas ao mínimo indispensável.

Figuras: fotografias, micrografias e radiografias devem ter uma largura mínima de 10 cm, resolução mínima de 500 dpi, e devem ser fornecidas em formato TIFF. Gráficos, desenhos, esquemas e demais ilustrações vetoriais devem ser fornecidos em formato PDF. Todas as figuras devem ser submetidas, individualmente, em arquivos separados (Figure 1a, Figure 1b, Figure 2...) e não inseridas no arquivo de texto. As figuras devem ser numeradas e citadas consecutivamente no corpo do texto, em algarismos arábicos. As legendas das figuras devem ser inseridas todas juntas no final do texto, após as referências.

Características e formatação dos tipos de manuscritos

Pesquisa Original

Devem ser limitados a 30.000 caracteres incluindo espaços (considerando-se introdução, metodologia, resultados, discussão, conclusão, agradecimentos, tabelas, referências e legendas de figuras). Será aceito um máximo de 8 (oito) figuras e 40 (quarenta) referências. O resumo deve conter, no máximo, 250 palavras.

Formatação Folha de rosto (*Title Page*)

- Texto principal (30.000 caracteres incluindo espaços)
- Resumo - máximo de 250 palavras
- Descritores - de 3 (três) a 5 (cinco) descritores principais
- Introdução
- Metodologia
- Resultados
- Discussão
- Conclusão
- Agradecimentos
- Referências - máximo de 40 referências
- Legendas de figuras
- Figuras - máximo de 8 (oito) figuras, conforme descrito acima
- Tabelas.

Resumo de Pesquisa Original (*Short Communication*)

Devem ser limitados a 10.000 caracteres incluindo

espaços (considerando-se, introdução, metodologia, resultados, discussão, conclusão, agradecimentos, tabelas, referências e legendas de figuras). É permitido um máximo de 2 (duas) figuras e 12 (doze) referências. O resumo deve conter, no máximo, 100 palavras.

Formatação

- Folha de rosto
- Texto principal (10.000 caracteres incluindo espaços)
- Resumo - máximo de 100 palavras
- Descritores - de 3 (três) a 5 (cinco) descritores principais
- Introdução
- Metodologia
- Resultados
- Discussão
- Conclusão
- Agradecimentos
- Referências - máximo de 12 referências
- Legendas de figuras
- Figuras - máximo de 2 (duas) figuras, conforme descrito acima
- Tabelas.

Revisão Crítica de Literatura

A submissão desse tipo de manuscrito será realizada apenas a convite da Comissão de Publicação da BOR. Todos os manuscritos serão submetidos à revisão por pares. Esse tipo de

manuscrito deve ter um conteúdo descritivo-discursivo, com foco numa apresentação e discussão abrangente de questões científicas importantes e inovadoras, e ser limitado a 30.000 caracteres incluindo espaços (considerando-se, introdução, metodologia, resultados, discussão, conclusão, agradecimentos, tabelas, referências e legendas de figuras). Incluir uma apresentação clara do objeto científico de interesse, argumentação lógica, uma análise crítica metodológica e teórica dos estudos e uma conclusão resumida. É permitido um máximo de 6 (seis) figuras e 50 (cinquenta) referências. O resumo deve conter, no máximo, 250 palavras.

Formatação

- Folha de rosto
- Texto principal (30.000 caracteres incluindo espaços)
- Resumo - máximo de 250 palavras
- Descritores - de 3 (três) a 5 (cinco) descritores principais
- Introdução
- Metodologia
- Resultados
- Discussão
- Conclusão
- Agradecimentos
- Referências - máximo de 50 referências
- Legendas de figuras

- Figuras - máximo de 6 (seis) figuras, conforme descrito acima
- Tabelas.

Revisão Sistemática e Meta-Análise

Ao resumir os resultados de estudos originais, sejam eles quantitativos ou qualitativos, esse tipo de manuscrito deve responder a uma questão específica, ser limitado a 30.000 caracteres, incluindo espaços, e seguir o estilo e formato Cochrane. O manuscrito deve informar detalhadamente como se deu o processo de busca e recuperação dos trabalhos originais, o critério de seleção dos estudos incluídos na revisão e fornecer um resumo dos resultados obtidos nos estudos revisados (com ou sem uma abordagem de meta-análise). Não há limite para a quantidade de referências e figuras. Tabelas e figuras, caso sejam incluídas, devem apresentar as características dos estudos revisados, as intervenções que foram comparadas e respectivos resultados, além dos estudos excluídos da revisão. Demais tabelas e figuras pertinentes à revisão devem ser apresentadas como descrito anteriormente. O resumo deve conter, no máximo, 250 palavras.

Formatação

- Folha de rosto
- Texto principal (30.000 caracteres incluindo espaços)
- Resumo - máximo de 250 palavras
- Formulação da pergunta

- Localização dos estudos
- Avaliação crítica Coleta de dados
- Análise e apresentação dos dados
- Aprimoramento
- Atualização da revisão
- Referências - não há limite para a quantidade de referências
- Figuras - não há limite para a quantidade de figuras
- Tabelas.

Carta ao Editor

Cartas devem incluir evidências que sustentem a opinião do(s) autor(es) sobre o conteúdo científico ou editorial da BOR, e ser limitadas a 500 palavras. Figuras ou tabelas não são permitidas.

"Checklist" para Submissão Inicial

- Arquivo de folha de rosto (*Title Page*, em formato DOC, DOCX ou RTF).
- Arquivo do texto principal (*Main Document*, manuscrito), em formato DOC, DOCX ou RTF.
- Tabelas, em formato DOC, DOCX ou EXCELL.
- Figuras: Fotografias, micrografias e radiografias (largura mínima de 10 cm e resolução mínima de 500 DPI) em formato TIFF. (http://www.ncbi.nlm.nih.gov/pmc/pub/filespec-images). Gráficos, desenhos, esquemas e demais ilustrações vetoriais em formato PDF. Cada uma das figuras deve ser submetida em

arquivos separados e individuais (não inseridas no arquivo de texto).

- Declaração de interesses e de financiamento, submetida em um documento separado e em formato PDF.

Termo de transferência de direitos autorais e declarações de responsabilidade

O manuscrito submetido para publicação deve ser acompanhado do Termo de Transferência de Direitos Autorais e Declarações de Responsabilidade, disponível no sistema online e de preenchimento obrigatório.

Plágio

A **BOR** emprega um sistema de detecção de plágio. Ao enviar o seu manuscrito para a Revista, este manuscrito poderá ser rastreado. Isto não tem relação com a simples repetição de nomes / filiações, mas envolve frases ou textos utilizados.

Custo para publicação

Os autores não são submetidos a uma taxa de submissão de artigos e de avaliação.

Exemplos de referências

Periódicos

Bhutta ZA, Darmstadt GL, Hasan BS, Haws RA. Community-based interventions for improving perinatal and neonatal health outcomes in developing countries: a review of the evidence. Pediatrics. 2005;115(2 Suppl):519-617. https://doi.org/10.1542/peds.2004-1441

Mattos FF, Pordeus IA. COVID-19: a new turning point for dental practice. Braz Oral Res. 2020;34:e085. https://doi.org/10.1590/1807-3107bor-2020.vol34.0085

Artigos com Título e Texto em Idioma Diferente do Inglês

Li YJ, He X, Liu LN, Lan YY, Wang AM, Wang YL. [Studies on chemical constituents in herb of Polygonum orientale]. Zhongguo Ahong Yao Za Zhi. 2005 Mar;30(6):444-6. Chinese.

Suplementos ou Edições Especiais

Pucca Junior GA, Lucena EHG, Cawahisa PT. Financing national policy on oral health in Brazil in the context of the Unified Health System. Braz Oral Res. 2010 Aug;24 Spec Iss 1:26-32.

Livros

Stedman TL. Stedman's medical dictionary: a vocabulary of medicine and its allied sciences, with pronunciations and derivations. 20th ed. Baltimore: Williams & Wilkins; 1961.

Livros Online

Foley KM, Gelband H, editors. Improving palliative care for cancer [monograph on the Internet]. Washington: National Academy Press; 2001 [cited 2002 Jul 9]. Available from: http://www.nap.edu/books/0309074029/html/

Websites

Cancer-Pain.org [homepage on the Internet]. New York: Association of Cancer Online Resources, Inc.; c2000 [cited 2002 Jul 9]. Available from: http://www.cancer-pain.org/ Instituto Brasileiro de Geografia e Estatística [homepage]. Brasília (DF): Instituto Brasileiro de Geografia e Estatística; 2010 [cited 2010 Nov 27]. Available from: http://www.ibge.gov.br/home/default.php

World Health Organization [homepage]. Geneva: World Health Organization; 2011 [cited 2011 Jan 17]. Available from: http://www.who.int/en/

ANEXO B – NORMAS PARA PUBLICAÇÃO NO PERIÓDICO PEDIATRIC DENTISTRY

As normas para submissão de artigo na revista Pediatric Dentistry são descritas no website: https://www.aapd.org/globalassets/media/publications/22-aapd-infoforauthors.pdf
Abaixo está a cópia dessas normas.

Pediatric Dentistry

Pediatric Dentistry is the official publication of the American Academy of Pediatric Dentistry, the American Board of Pediatric Dentistry and the College of Diplomates of the American Board of Pediatric Dentistry. It is published bi-monthly and is internationally recognized as the leading journal in the area of pediatric dentistry. The journal promotes the practice, education and research specifically related to the specialty of pediatric dentistry. This peer-reviewed journal features scientific articles, systematic reviews, clinical practice guidelines and abstracts of current pediatric dental research.

Journal of Dentistry for Children

The *Journal of Dentistry for Children* (***JDC***) is an internationally renowned journal whose publishing dates back to 1934. Published three times a year, *JDC* promotes the practice, education and research specifically related to the specialty of pediatric dentistry. It covers a wide range of topics related to the clinical care of children, from clinical techniques of daily importance to the practitioner, to studies on child behavior and growth and development. *JDC* also provides information on the physical, psychological and emotional conditions of children as they relate to and affect their dental health. This peer-reviewed journal features scientific articles, literature reviews, case reports, and abstracts of current pediatric dental research.

Introduction

Manuscripts that are selected for publication promote the practice, education and research for the specialty of pediatric dentistry. Manuscripts are considered for publication only if the article, or any part of its essential substance, tables or figures have not been or will not be published in another journal or are not simultaneously submitted to another journal.

The statements, opinions, and advertisements are solely those of the individual authors, contributors, editors, or advertisers, as indicated. Published manuscripts do not necessarily represent theviews of the editor, the AAPD Publications and Communi-cations Department, or the American Academy of Pediatric Dentistry organization.

Types of Manuscripts (*for summary, see table on pg 2)*

Type of manuscript must be one of the following: *Meta- Analyses/Systematic Reviews*, *Scientific Studies*, *Case Reports* (***JDC*** only), or *Literature Reviews* (***JDC*** only), *Brief Communications, Letters to the Editor*, and *Editorials*. Authors submitting manuscripts are expected to follow these instructions before submissions will be accepted for review consideration.

Meta-Analyses / Systematic Reviews

Authors of systematic reviews must adhere to Preferred Re-porting Items for *Systematic Reviews* and *Meta-Analyses*, available at: "http://www.prisma-statement.org/documents/PRISMA_2020 _checklist.docx" to obtain the 'PRISMA checklist'. Systematic review submissions should include a protocol registered prior to data extraction at the PROSPERO registration website: "http:// prisma-statement.org/Protocols/Registration". Structured *Abstracts* for systematic reviews are required. Headings should include: *Research Question, Research Protocol, Literature Search, Data Extraction, Quality Appraisal, Data Analysis* and *Results*, and *Interpretations of Results*.

Systematic reviews may contain data from randomized/non-randomized controlled trials, cohort, case-controlled studies, cross-sectional, or in vitro data. Those reviews that result in very few studies, are not clinically relevant, or do not advance science may be rejected before review.
Maximum Figures: 4 • Maximum Tables: 4 or total of 8 Figures and Tables combined.

Scientific Studies

Full-length manuscript not to exceed 3,500 words (including structured *Abstract*, *Introduction*, *Methods*, *Results*, *Discussion*, *Conclusions*, and *Acknowledgments*; excluding *References* and *Figure Legends*). The structured abstract should be no longer than 250 words and contain the following sections: *Purpose*, *Methods*, *Results*, and *Conclusions*.

The *Introduction* section should include only pertinent references. The *Methods* section should be sufficiently detailed to replicate the study. The *Results* section should include only results and not discussion of the data. The *Discussion* section should discuss the results, of the present study and compare them to the existing knowledge base. The *Conclusions* section should consist of succinct, numbered statements that are sup-ported by the results of the study (i.e., application of the find-ings). Statements in the *Conclusions* section should not repeat the *Results* section.

Maximum Figures: 4 • Maximum Tables: 3 or total of 8 Figures and Tables combined.

Randomized Clinical Trials*.* Studies that are *Randomized Clinical Trials* should review and consider CONSORT guidelines and checklist available at: "www.consort-statement.org". The statement in the text should be accom-panied by a numbered reference to the guidelines.

Maximum Figures: 4 • Maximum Tables: 3 or total of 8 Figures and Tables combined.

case-controlled and cross-sectional studies must include submission of STROBE checklist addressing the guidelines available at: “www.strobe-statement.org/index.php?id=avao;ab; e-checklists”. The statement in the text should be accompanied by a numbered reference to the guidelines.

Maximum Figures: 4 • Maximum Tables: 3 or total of 8 figures and tables combined.

Case Reports (JDC only)

Full-length manuscript not to exceed 1,850 words (including unstructured *Abstract*, brief *Introduction*, *Description of Case*, *Discussion*, *Acknowledgments* (if any), and *References*. The unstruc-tured *Abstract* should be no longer than 150 words.

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Manuscript not to exceed 2,000 words (including structured *Abstract*; excluding *References* and *Figure legend*). The structured *Abstract* should be no longer than 150 words. The scope of this style submission is for concise scientific, including pilot studies, preliminary findings and not intended to be a substitute for literature review.

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Title: Titles should be as brief as possible while clearly convey-ing the main point or purpose of the article. The manuscript title is limited to 20 words or less, and a short title limited to five words or less must also be submitted. All submissions, in-cluding titles and subheads, are subject to change during the editing process.

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Introduction: The introduction should provide the context for the article, the objective of the study, and should state the hypothesis or research question (purpose statement), how and why the hypothesis was developed, and why it is important. It should generally not exceed two or three paragraphs.

Methods: The methods section should include as appropriate, a detailed description of the study design or type of analysis and dates and period of study; condition, factors, or disease studied; details of sample (e.g., study participants and the setting from which they were drawn); method of random sequence generation in detail (coin flip, random table, etc.); method of allocation concealment in detail (opaque envelopes, sequential numbered drug containers, etc); description of treatment providers; whether providers and participants were blinded; inclusion and exclusion criteria; intervention(s), if any; outcome measures; method of blinding of outcome assessors; method of standardization and calibration of outcome assessors, including kappa statistics; and statistical analysis.

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Journal

For journals, list all authors when there are six or fewer; when there are seven or more, list the first three, then 'et al.' Page numbers should be included where possible. For example: 12-8, 191-5, 347-51.

Bogert TR, García-Godoy F. Effect of prophylaxis agents on the shear bond strength of a fissure sealant. Pediatr Dent 1992;14(1):50-1.

Book

Bixler D. Genetic aspects of dental anomalies. In: McDonald RE, Avery DR, eds. Dentistry for the Child and Adoles-cent. 5th ed. Philadelphia: CV Mosby Co.; 1987:90-116.

The Reference Manual of Pediatric Dentistry

For Clinical Practice Guidelines, do not use the reference manual but rather the original source that it was published in. When referencing other documents in this manual, use the latest publication for example:

American Academy of Pediatric Dentistry. **Document's title**. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 202**X (optional to include year of the version used if not the current)**: **page range**.

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Medicine for the public: Women's health research Bethesda, Md.: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health; 2001. DHHS publication 02-4971.

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Statistical tests: The results of all statistical comparisons should be reported to include the statistical test value and the associated *P*-value and confidence interval, if appropriate. Except when one-sided tests are required by study design, such as in non-inferiority trials, all reported *P*-values should be two-sided. In general, *P*-values larger than 0.01 should be reported to two decimal places, those between 0.01 and 0.001 to three decimal places; *P*-values smaller than 0.001 should be reported as *P*<0.001. Results in the abstract and the paper generally should include estimates of effect size and 95 percent confidence intervals (95% CI), not just *P*-values or statements that a difference was statistically significant.

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