Original Research
Pediatric Dentistry

Minimal intervention procedures: evaluating how much pediatric dentists really know about this field

Laércio Alves de AMORIM JUNIOR[a]
Bárbara Rodrigues BRAGA[b]
Caio Gomes CASTRO[b]
Patrícia CORRÊA-FARIA[b]

[a]Universidade Federal de Goiás – UFGO, School of Dentistry, Goiânia, GO, Brazil.

[b]Faculdade Sul-Americana, School of Dentistry, Goiânia, GO, Brazil.

Declaration of Interests: The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

Corresponding Author:
Patrícia Corrêa-Faria
E-mail: patriciafaria.faria09@gmail.com

https://doi.org/10.1590/1807-3107bor-2022.vol36.0124

Submitted: September 29, 2021
Accepted for publication: May 2. 2022
Last revision: May 30, 2022

Abstract: The aim of this cross-sectional study was to evaluate how much pediatric dentists know about the noninvasive, micro, and minimally invasive strategies for managing caries lesions in deciduous teeth. An electronic questionnaire was sent to pediatric dentists enrolled in the Regional Board of Dentistry. Information was collected concerning: 1) characteristics of the participants; 2) level of updated knowledge of noninvasive, micro and minimally invasive procedures for caries management in children; 3) agreement to sentences on the indicated procedures. The data were analyzed descriptively and with bivariate tests. Seventy pediatric dentists participated. Results showed high frequency of agreement with sentences on strategies for lesion caries management: 92.8% with the sentence on selective removal of decayed tissue; 90.0% on fluoridated toothpaste (≥1,000 ppm); 84.3% on silver diamine fluoride (SDF); 80.0% on the Hall technique; and 76.9% on the sealing of small dentine lesions. Level of agreement with sentences was not significantly related to variables of time since graduation, degree of updatedness, area of employment, or higher education degree ($p > 0.05$). A higher score on agreement toward SDF use was accompanied by a greater degree of self-declared updatedness on noninvasive, micro and minimally invasive procedures for caries management in children (rho 0.259; $p = 0.031$). Pediatric dentists consider themselves updated and agree with the sentences on recommended use of fluoridated toothpaste as of eruption of the first tooth, and on the selective removal of decayed tissue. Disagreement still continues regarding application of SDF to arrest lesion progression, sealing of small dentin lesions, and the Hall technique.

Keywords: Dental Caries; Pediatric Dentistry; Knowledge; Tooth, Deciduous.

Introduction

For a long time, dental caries management has focused on interventions such as restorations and extractions, but little attention was paid to prevention and early intervention to prevent the progression of lesions.[1] Decidedly, a preventive approach can greatly improve the oral health of patients in the long term.[1] Management should go beyond curative procedures, and address both the root causes of the lesion, and the

causality of the patient.[2] Deterring risk behaviors, early diagnosis, arresting lesion progression, and preserving one's dental structure should motivate the caries patient's approach.[2,3] These aspects are part of the minimal intervention approach,3 an alternative to the traditional method of dental caries management. Noninvasive, micro or minimally invasive strategies for the management of caries lesions are the foundation of minimal intervention. These strategies should be selected according to the stage, location and activity of the lesions.[2] Noninvasive, micro- or mini-invasive procedures preserve the healthy or recoverable dental structure, arrest lesion progression, and remineralize hard dental tissue.[4] Procedures indicated by the dentist, such as the application of silver diamine fluoride (SDF),[5] regular fluoride application,[5] the Hall technique,[6] and selective caries removal[6] are supported by scientific evidence, and have recently been reinforced by the consensus of experts. [2,7,8]

Although scientific evidence emphasizes the efficacy of noninvasive, micro, or minimally invasive strategies, invasive approaches are common. A study conducted with Brazilian students and dentists showed that there are divergences regarding the management of carious lesions based on minimal intervention in dentistry (MID), especially when they are deep. The participants, including pediatric dentists, evaluated images and descriptions of clinical cases involving permanent teeth.[9] Similar results were observed in other countries. Studies with Russian and French dentists, and with students have shown that many participants still do not apply the concepts of MID when treating caries lesions. The investigations highlight the need to review and update both clinical protocols for caries treatment and the curriculum of dental schools to ensure that they focus on evidence-based practice and MID strategies.[10,11]

To date, there is little evidence on how well pediatric dentists know MID procedures, and on how effectively they can indicate MID for caries lesions in the primary dentition. Although most dentists know how to use silver diamine fluoride (SDF) and steel crowns,[12,13] the published studies have investigated how well they know and can use SDF and steel crowns in the pediatric dental clinic.[12,13] In the United States, pediatric dentists have been seen to use SDF more frequently now than in past years.[12]

MID-based procedures are welcome in pediatric dentistry, because they advocate the preservation of tissues, educate the child and his/her family about oral health, and contribute to the management of child behavior.[14] The adoption of either noninvasive or invasive strategies seems to depend on the knowledge of the professionals, their ability to perform the respective procedure, and their decision to perform the intervention based on evidence. Therefore, the aim of this study was to evaluate how well pediatric dentists know the noninvasive, micro or minimally invasive strategies for the management of caries lesions in the deciduous teeth. Our hypothesis was that pediatric dentists know the MID procedures.

Methodology

This cross-sectional study was evaluated and approved by the local human research ethics committee (Protocol number 4.363.717). Participants were informed of the objective of the study, and how to participate, and signed an informed consent form electronically. This study was reported following the STROBE guidelines.[15]

Study design and setting

This was a cross-sectional study conducted in the state of Goiás, in the Midwest of Brazil. The data were obtained in one sitting from pediatric dentists who completed an electronic questionnaire.

Participants

Pediatric dentists regularly enrolled in the Regional Board of Dentistry (CRO-GO) were included in the study. Pediatric dentists who were not engaged in clinical practice, or who were teaching were excluded.

Variables

The data were obtained using an electronic questionnaire. The questionnaire was divided into the following parts:

a. Sociodemographic and professional characteristics, such as age, sex, type of

institution where the professional graduated (public or private), time since completion of his undergraduate degree in dentistry, and time since the conclusion of his specialization in pediatric dentistry, higher education degree (specialization, specialization and master's degree, specialization and doctor's degree), and area of employment (academic, private practice, public service, public service and private practice).

b. Degree of updatedness in noninvasive, micro and minimally invasive procedures for caries management in children: "how well do you consider yourself updated on noninvasive, micro or minimally invasive procedures to indicate them for caries management in children?" Response options – totally outdated, partially outdated, neutral, partially updated, fully updated.

c. Agreement to sentences regarding indicated procedures – statements addressing the recommended use of fluoridated toothpaste, application of silver diamine fluoride, application of sealants in cavitated enamel and moderate dentin lesions, selective removal of carious tissue, and the Hall technique. The answer options were: I totally disagree; I partially disagree; I don't know; I partially agree; I totally agree.

Sentence #1 – "Brushing should be performed with fluoridated toothpaste (minimum 1000 ppm fluoride), at least twice a day, as soon as the child's first tooth erupts."

Sentence #2 - "Carious lesions in dentin without pulp involvement can be arrested by applying cariostatic SDF in a concentration of at least 30%."

Sentence #3 - "Sealants can be used as therapeutic agents in enamel-cavitated lesions and moderate dentin lesions, after checking the depth and extent of the lesion."

Sentence #4 - "Selective removal of decayed tissue involves removal of softened dentin and leaving the consistent dentin. In very deep cavities, softened dentin should be left in the pulp wall. After tissue removal, the cavity can be sealed with adhesive materials such as glass ionomer cement."

Sentence #5 - "The Hall technique is an option for the treatment of deciduous molars with caries lesions involving two or more surfaces. In this technique, the crown is cemented without prior removal of decayed tissue or the preparation of the tooth."

The statements on the professional's indication of the appropriate techniques were based on the recommendations of the Asociación Latinoamericana de Odontopediatría (ALOP),[16] and were drafted in consensus with the European Organization for Caries Research (ORCA) and the European Federation of Conservative Dentistry (EFCD)/German Association of Conservative Dentistry (DGZ).[7]

The structure of the questionnaire was based on a previous study that evaluated Brazilian dentists' knowledge of terminology and recommendations on the removal of decayed tissue.[9] Prior to data collection, the questionnaire was read and evaluated by two pediatric dentists who work as professors in undergraduate dental studies. No changes were suggested. The questionnaire was tested by applying it to five dentists who did not participate in the main study. No difficulty or doubts were found in how to fill out the questionnaire.

Data sources/measurement

Data were collected using an electronic questionnaire (Google Forms) based on another one used in previous research.[9] An invitation to the pediatric dentists to participate in the study was published weekly on social media, and was sent by email to professionals belonging to the Regional Board of Dentistry (CRO-GO), in an effort to reach a broad target audience. The objectives of the study, information on participation, and the link to access the questionnaire were made available to pediatric dentists in an electronic message sent by the CRO-GO. According to the Federal Council of Dentistry, there were a total of 477 pediatric dentists enrolled in the CRO-GO (https://website.cfo.org.br/) when the study was planned in August 2020.

A link to access the questionnaire was made available on the social media designed to disseminate the research. The researchers monitored social media daily, and used the search tool to look for pediatric dentists, to whom they sent messages/invitations to

participate in the research. Data collection took place from November 2020 to June 2021.

Bias

The participants were instructed to answer the questions without consulting any other material on the subject. Information about the research and the electronic questionnaire were sent to all pediatric dentists enrolled in the Regional Board of Dentistry. A social media page was designed to disseminate the study, and provide the access link to the questionnaire, in an effort to reach a greater number of potential participants. The subject material of the study was disseminated by publishing it weekly on social media.

Study size

The invitation to participate in the study was sent via email by the Regional Board of Dentistry (CRO-GO) to all registered pediatric dentists.

Variables

The outcome variables - self-declared degree of updatedness in MID and agreement with the oral conditions - were classified as ordinal. These variables were assessed by means of nonparametric tests. This was achieved by analyzing the assigned scores as numerical data.

Statistical methods

The data were organized and analyzed in the Statistical Package for the Social Sciences (SPSS for Windows, version 25.0, SPSS Chicago, USA). Assessments were made of frequency for qualitative variables, and of mean and standard deviation for quantitative variables. The Spearman correlation test was applied to establish the relationship between the participant's dental practice time, the degree of self-declared updatedness, and the level of agreement with the sentences on MID procedures. The nonparametric Mann-Whitney and Kruskal-Wallis tests were used when comparing the scores attributed to degree of updatedness and the level of agreement with the sentences on MID procedures with other variables (type of institution, area of employment, and higher education specialization/degree). A significance level of 5% was adopted.

Results

Seventy-five pediatric dentists agreed to participate in the study. Five of these were excluded because their practice did not involve clinical activities, leaving 70 pediatric dentists (mean age 41.7 years [standard deviation 11.9]; 97.1% women). The mean time since graduation and completion of their specialization was 17.9 (standard deviation 11.3) and 12.5 (9.6) years, respectively. The most common academic degree was only specialization (75.7%), followed by specialization and Master's (14.3%), and specialization and PhD degree (10.0%). More than half of the participants worked in private practice (65.8%). Approximately half, declared themselves to be fully updated on MID procedures (Table 1).

There was high agreement - more than 90% - on the sentences regarding the use of fluoridated

Table 1. Characteristics of the participants.

Variable	n (%)
Sex	
Female	68 (97.1)
Male	2 (2.9)
Type of institution (graduation)	
Private	45 (64.3)
Public	25 (35.7)
Higher education	
Specialization	53 (75.7)
Specialization and master's degree	10 (14.3)
Specialization and doctor's degree	7 (10.0)
Area of employment	
Private practice	46 (65.8)
Public service and private practice	14 (20.0)
Academic	5 (7.1)
Public service	5 (7.1)
Degree of updatedness in MID	
Totally outdated	1 (1.4)
Partially outdated	1 (1.4)
Neutral	1 (1.4)
Partially updated	31 (44.3)
Fully updated	36 (51.5)

Table 2. Sentences and answers.

Sentence	Answer option	n (%)
#1 - Brushing after eruption of the first tooth should be performed with fluoridated toothpaste (minimum 1000 ppm fluoride) at least twice a day.	I totally disagree	3 (4.3)
	I partially disagree	4 (5.7)
	I don't know	0 (0.0)
	I partially agree	5 (7.1)
	I totally agree	58 (82.9)
#2 - Carious lesions progression in dentin with no pulp involvement can be arrested by applying cariostatic silver diamine fluoride in a concentration of at least 30%."	I totally disagree	4 (5.7)
	I partially disagree	3 (4.3)
	I don't know	4 (5.7)
	I partially agree	20 (28.6)
	I totally agree	39 (55.7)
#3 - Sealants can be used as therapeutic agents in enamel cavitated lesions and moderate dentin lesions, after determining the extent and depth of the lesion.*	I totally disagree	9 (13.0)
	I partially disagree	4 (5.8)
	I don't know	3 (4.3)
	I partially agree	23 (33.4)
	I totally agree	30 (43.5)
#4 - Selective removal of decayed tissue is based on removal of the softened dentin, and maintenance of more consistent dentin. In very deep cavities, softened dentin can be left in the pulp wall. After tissue removal, the cavity can be sealed with adhesive materials such as glass ionomer cement.	I totally disagree	2 (2.9)
	I partially disagree	3 (4.3)
	I don't know	0 (0.0)
	I partially agree	9 (12.8)
	I totally agree	56 (80.0)
#5 – The Hall technique is an option for the treatment of deciduous molars with caries lesions involving two or more surfaces. In this technique, the crown is cemented without prior removal of decayed tissue or tooth preparation.	I totally disagree	1 (1.4)
	I partially disagree	4 (5.7)
	I don't know	9 (12.9)
	I partially agree	15 (21.4)
	I totally agree	41 (58.6)

*01 lost given.

toothpaste as of eruption of the first deciduous tooth (90.0%), and the selective removal of carious tissue (92.8%). The lowest frequencies of agreement were observed for the sentences on the application of sealants in enamel cavitated lesions and moderate dentin lesions (76.9%), and for the Hall technique (80.0%) (Table 2).

The correlation between the variables of time since graduation and the degree of updatedness in MID was not found to be significant. A similar result was observed in the correlation between the time since specialization and the self-declared degree of updatedness. The correlation test was applied to the variables of higher education, degree of updatedness, and score attributed to each sentence, but was not found to have significant results ($p > 0.05$). A significant and positive correlation was observed only when the variables of self-declared degree of updatedness and application of SDF to arrest carious lesion progression (sentence #2) were combined. An increase in the score for self-declared degree of updatedness was accompanied by greater agreement with the statement on using SDF to arrest caries lesions (Table 3).

There was no significant difference in the self-declared degree of updatedness between the categories of the area of employment ($p = 0.0.949$) and the type of institution ($p = 0.583$) (Table 4). The level of agreement with the sentences did not differ significantly among the categories of area of employment ($p > 0.05$) (Table 5).

Table 3. Correlation among degree of updatedness in MID, agreement with the sentences, and time since graduation of the participants.

Variable	Degree of updatedness	Sentence #1	Sentence #2	Sentence #3	Sentence #4	Sentence #5
Degree of updatedness		rho 0.100	rho 0.259	rho 0.221	rho 0.133	rho -0.002
		p = 0.408	p = 0.031	p = 0.068	p = 0.271	p = 0.986
Time since graduation	rho 0.143	rho -0.148	rho 0.044	rho -0.110	rho 0.002	rho -0.035
	p = 0.236	p = 0.222	p = 0.718	p = 0.370	p = 0.986	p = 0.776
Time since specialization	rho 0.166	rho -0.211	rho -0.058	rho -0.151	rho 0.026	rho -0.048
	p = 0.177	p = 0.084	p = 0.636	p = 0.223	p = 0.831	p = 0.696

Sentences: #1 use of fluoridated toothpaste; #2 application of SDF; #3 application of sealant in caries lesions; #4 removal of carious tissue; #5 Hall technique.

Table 4. Comparison of degree of updatedness in MID, between the categories of independent variables.

Variable	Median	Minimum-maximum	p-value
Type of institution (graduation)			0.583
Private	4.0	1.0–5.0	
Public	5.0	2.0–5.0	
Area of employment			0.949
Private practice	5.0	1.0–5.0	
Public service and private practice	4.5	4.0–5.0	
Academic	5.0	4.0–5.0	
Public service	4.0	4.0–5.0	

Discussion

This study evaluated how well pediatric dentists consider themselves updated on MID procedures, and how much they agree with sentences that both contextualize and exemplify some of the MID-indicated procedures. More than 90% of the participants considered themselves as being up-to-date, and most agreed with the sentences. A high frequency of "totally agree" and "partially agree" responses were observed mainly in the sentences on the recommended use of fluoridated toothpaste and selective removal of carious tissue. In the sentences on the use of sealants in enamel and/or dentin lesions, the application of SDF, and the Hall technique, there was less agreement and even "don't know" responses.

The minimal intervention approach came into greater evidence after the publication of the Policy Statement "Minimal Intervention Dentistry (MID) for Managing Dental Caries" issued by the World Dental Federation.[17] Since then, several strategies to diagnose, prevent and treat lesions have been adopted. However, the adoption of this approach in the curricula of dental schools is still ongoing. Countries such as Canada,[18] Colombia[19] and Spain[20] have proposed a cariology curriculum for their dental schools, including topics such as diagnosis, and surgical and non-operative approaches to caries lesions. It seems as though Brazil has no standardized cariology curriculum yet. However, the first step toward this end has already been taken by the research work published in 2018,[21] in which the cariology training of students from the five regions of the country was evaluated. The results indicate that most participating institutions support the development of a cariology curriculum, and that the relevant topics are dental caries prevention (role of fluoride in caries prevention), remineralization and monitoring. These topics are part of the MID context. On the other hand, issues such as minimal intervention, atraumatic restorative treatment, and sealing of carious lesion are considered important by

Table 5. Comparison of the level of agreement with the sentences on MID procedures between the categories of independent variables

Variable	Agreement with the sentences on MID procedures									
	#1		#2		#3		#4		#5	
	Median (minimum-maximum)	p-value	Median (minimum-maximum)	p-value	Median (minimum-maximum)	p-value	Median (minimum-maximum)	p-value	Median (minimum-maximum)	p-value
Type of institution (graduation)		0.104		0.697		0.580		0.972		0.604
Private	5.0 (1.0–5.0)		5.0 (1.0–5.0)		4.0 (1.0–5.0)		5.0 (1.0–5.0)		5.0 (1.0–5.0)	
Public	5.0 (4.0–5.0)		5.0 (1.0–5.0)		4.0 (1.0–5.0)		5.0 (1.0–5.0)		5.0 (2.0–5.0)	
Higher education		0.099		0.534		0.883		0.241		0.600
Specialization	5.0 (1.0–5.0)		5.0 (1.0–5.0)		4.0 (1.0–5.0)		5.0 (1.0–5.0)		5.0 (1.0–5.0)	
Specialization and master's degree	5.0 (5.0–5.0)		5.0 (2.0–5.0)		4.0 (2.0–5.0)		5.0 (1.0–5.0)		4.5 (2.0–5.0)	
Specialization and doctor's degree	5.0 (2.0–5.0)		5.0 (2.0–5.0)		4.0 (2.0–5.0)		5.0 (5.0–5.0)		5.0 (4.0–5.0)	
Area of employment		0.106		0.456		0.550		0.706		0.570
Private practice	5.0 (1.0–5.0)		4.5 (1.0–5.0)		4.0 (1.0–5.0)		5.0 (1.0–5.0)		5.0 (1.0–5.0)	
Public service and private practice	5.0 (5.0–5.0)		5.0 (1.0–5.0)		4.0 (1.0–5.0)		5.0 (1.0–5.0)		5.0 (2.0–5.0)	
Academic	5.0 (2.0–5.0)		5.0 (2.0–5.0)		5.0 (2.0–5.0)		5.0 (5.0–5.0)		5.0 (4.0–5.0)	
Public service	5.0 (5.0–5.0)		5.0 (4.0–5.0)		5.0 (4.0–5.0)		5.0 (4.0–5.0)		5.0 (2.0–5.0)	

Sentences: #1 use of fluoridated toothpaste; #2 application of SDF; #3 application of sealant in caries lesions; #4 removal of carious tissue; #5 Hall technique.

the respondents. The next step toward standardizing and updating the cariology curriculum in Brazil is to hold a workshop/symposium to prepare the official documents and their implementation.[22]

In this study, most of the pediatric dentists consider themselves updated in MID, confirming our hypothesis. This can be explained by the approach to cariology that has been established mainly in pediatric dentistry disciplines.[21] One study found that 8 out of 13 higher education institutions in the Midwest addressed cariology in pediatric dentistry.[22] Teaching cariology in undergraduate studies was investigated, and found to possibly limit the generalization of results for specialization. However, it should be inferred that, if this topic is already part of the undergraduate course curriculum, it should also be addressed in graduate studies.

The level of MID updatedness was similar among participants who graduated from public and private institutions an average of 18 years ago. This period coincides with the beginning of peak interest in MID-oriented dentistry.[17] It could be that participants who graduated from private and public institutions had no contact with MID content before graduating. Their specialization course was concluded about 12 years ago. We believe that MID topics were not a current issue at the time, and therefore not part of the undergraduate curriculum of any institution. Hence, in the present study, the type of institution (public or private) cannot be said to have any bearing on how much the dentist knows on the subject of MID.

The knowledge of MID (level of agreement with sentences) of pediatric dentists was statistically similar among participants with different levels of education. However, in sentences with lower agreement, such as the use of SDF and Hall technique, the participants with higher education (doctor's degree) had lower

variations in the minimum-maximum scores, and approached the totally agree option. It could be that the lack of a statistically significant difference in the knowledge of pediatric dentists according to their level of education may be attributed to the small number of participants, and that future studies with a larger number of participants may provide a better idea of the association between level of education and knowledge about MID. This implies that pediatric dentists with a higher level of education may have greater knowledge of MID.

Indicating fluoridated toothpaste as of the eruption of the first tooth was a consensus reached among most pediatric dentists. This recommendation has been adopted by the Brazilian Association of Pediatric Dentistry,[22] based on robust evidence of high and moderate certainty that fluoride toothpaste at a concentration of ³1000 ppm reduces caries increments, in comparison with non-fluoride toothpaste.[24] Despite the high frequency of agreement, 10% of the participants partially or totally disagreed with the sentence. A possible explanation is that these professionals base their decisions on previous recommendations, and are also afraid of the risk of dental fluorosis. This risk should be minimized by recommending that caution be exercised regarding the amount of toothpaste to be used, and that the responsibility of young children's tooth brushing be assigned to caregivers.[24]

Most participants agreed fully or partially with the sentence on selective caries removal. Conventionally, the most widely opted procedure was the complete removal of decayed tissue, in order to eliminate cariogenic bacteria and retain the restorative material better.[25] Today, this procedure is considered an overtreatment. Based on current evidence, it is recommended that only irreversibly demineralized tissue be removed. Selective removal favors preserving remineralization-prone structures and non-demineralized tissue, reducing patient discomfort and anxiety, and avoiding irritation and pulp exposure.[26] This questionnaire sentence had the fewest disagreement responses. This seems to indicate that pediatric dentists know the benefits of selective removal, and probably adopt this procedure in clinical practice.

Approximately 80% of the participants agreed to apply SDF to arrest caries lesion progression in dentin. Despite the high frequency of agreement, this was one of the sentences with the highest percentage of disagreement and "I don't know" responses. The low frequency of agreement could be explained by the topic of SDF not always being addressed in undergraduate and graduate/specialization courses. In a study conducted with pediatric dentists in the United Kingdom, only 3% of the participants reported having been well/very well instructed on SDF.[14] It is suggested that a similar situation prevails in Brazil, since minimal intervention has not yet become a frequent topic in the curricula of dental schools.[22] This hypothesis seems to be confirmed even further by the positive and significant correlation between the level of self-reported updatedness and the agreement with the statement on the use of SDF (#2). Higher professional education goes hand in hand with a higher degree of self-reported knowledge.[14] The terms "to arrest caries lesion progression" and "the mechanism of action of scans" are still unknown by some pediatric dentists.

A similar result was observed for the sentences on the sealing of small dentine lesions (#3) and the Hall technique (#5). The frequency of the "do not know" response stands out (≅ 13%), especially in regard to the sentence on the Hall technique. Scientific evidence supports that both techniques may be indicated.[10,27] However, as suggested regarding the use of SDF, it is believed that neither technique is frequently addressed in undergraduate and/or specialization courses, thereby explaining why the participants were not very familiar with these MID procedures. As for the Hall technique, the difficulty in acquiring steel crowns on the Brazilian market is an aggravating factor, since it hinders the practical teaching of the technique.

Less than 20% of pediatric dentists enrolled in the Regional Board of Dentistry participated in the study. The small number of participants is a limitation of this study and stresses the need for caution in interpreting and generalizing results. A representative sample of the pediatric dentist population of Goiás was not reached, despite all efforts to reach the maximum number of participants. The survey questionnaire was

sent to all pediatric dentists registered at the Regional Board of Dentistry, with the intention of broadening participation. We combined email recruitment with the dissemination and sending of messages on social media, in an attempt to increase the response rates.[28] Data collection in person would be another way to seek a greater number of participants. However, this was not an option, because of the restrictions related to the COVID-19 pandemic. An approach for future studies would be to have participants interact face-to-face. Other suggestions for future investigations include illustrating clinical cases related to the study sentences, and questioning pediatric dentists about the use of noninvasive, micro and minimally invasive strategies in clinical practice.

Only pediatric dentists participated in the study. These professionals chose to dedicate themselves to pediatric dentistry, and may not represent other non-specialist professionals who extend care to children and guidance to dental students. Dentists should learn about MID in their training experience, so that their knowledge can later be incorporated into future body of teaching guidelines.

Conclusions

Based on the findings of this study, it was concluded that pediatric dentists consider themselves updated on MID strategies, regardless of their degree and place of training. The consensus among most participants is that fluoridated toothpaste should be recommended as soon as the first tooth erupts, and that decayed tissue should be removed selectively. On the other hand, it seems that their knowledge regarding certain procedures should be updated, such as the application of SDF to arrest lesion progression, the sealing of small dentin lesions, and the Hall technique. Likewise, disseminating scientific evidence on MID procedures, maintaining knowledge constantly updated, and basing practices on evidence are urgent needs.

References

1. Calache H, Hopcraft MS, Martin JM. Minimum intervention dentistry: a new horizon in public oral health care. Aust Dent J. 2013 Jun;58(58 Suppl 1):17-25. https://doi.org/10.1111/adj.12046
2. Pozos-Guillén A, Molina G, Soviero V, Arthur RA, Chavarria-Bolaños D, Acevedo AM. Management of dental caries lesions in Latin American and Caribbean countries. Braz Oral Res. 2021 May;35 suppl 01:e055. https://doi.org/10.1590/1807-3107bor-2021.vol35.0055
3. Walsh LJ, Brostek AM. Minimum intervention dentistry principles and objectives. Aust Dent J. 2013 Jun;58 Suppl 1:3-16. https://doi.org/10.1111/adj.12045
4. Innes NP, Manton DJ. Minimum intervention children's dentistry: the starting point for a lifetime of oral health. Br Dent J. 2017 Aug;223(3):205-13. https://doi.org/10.1038/sj.bdj.2017.671
5. Schmoeckel J, Gorseta K, Splieth CH, Juric H. How to intervene in the caries process: early childhood caries - a systematic review. Caries Res. 2020;54(2):102-12. https://doi.org/10.1159/000504335
6. Santamaría RM, Abudrya MH, Gül G, Mourad MS, Gomez GF, Zandona AG. How to intervene in the caries process: dentin caries in primary teeth. Caries Res. 2020;54(4):306-23. https://doi.org/10.1159/000508899
7. Splieth CH, Banerjee A, Bottenberg P, Breschi L, Campus G, Ekstrand KR, et al. How to intervene in the caries process in children: a joint ORCA and EFCD expert delphi consensus statement. Caries Res. 2020;54(4):297-305. https://doi.org/10.1159/000507692
8. Sampaio FC, Bönecker M, Paiva SM, Martignon S, Ricomini Filho AP, Pozos-Guillen A, et al. Dental caries prevalence, prospects, and challenges for Latin America and Caribbean countries: a summary and final recommendations from a Regional Consensus. Braz Oral Res. 2021 May;35 suppl 01:e056. https://doi.org/10.1590/1807-3107bor-2021.vol35.0056
9. Sales GC, Marques MG, Rubin DR, Nardoni DN, Leal SC, Hilgert LA, et al. Are Brazilian dentists and dental students using the ICCC recommendations for caries management? Braz Oral Res. 2020 Jun;34:e062. https://doi.org/10.1590/1807-3107bor-2020.vol34.0062
10. Drachev SN, Galieva AS, Yushmanova TN, Polivanaya EA, Stangvaltaite-Mouhat L, Al-Mahdi R, et al. Restorative treatment decisions for carious lesions: do Russian dentists and dental students apply minimal intervention dentistry? BMC Oral Health. 2021 Dec;21(1):638. https://doi.org/10.1186/s12903-021-01978-2
11. Gasqui MA, Laforest L, Le Clerc J, Ceinos R, Chemla F, Chevalier V, et al. Knowledge and opinions of French dental students in operative dentistry - management of deep carious lesions. Oral Health Prev Dent. 2021 Jan;19(1):627-34. PMID:34874140

12. Crystal YO, Janal MN, Yim S, Nelson T. Teaching and utilization of silver diamine fluoride and Hall-style crowns in US pediatric dentistry residency programs. J Am Dent Assoc. 2020 Oct;151(10):755-63. https://doi.org/10.1016/j.adaj.2020.06.022
13. Ezzeldin T, Al-Awasi K, Bader RM, Alshaikhi AY, Hakami AH, Siddiqui IA et al. A study to assess the awareness and use of silver diammine fluoride and Hall technique among dental professionals and dental students in the Eastern Province. Saudi Dent J 20221;33(8):1166-73. https://doi.org/10.1016/j.sdentj.2021.01.005
14. Hamouda M, Deery C. What is the best caries removal strategy for primary molars? Evid Based Dent. 2021 Jan;22(1):20-1. https://doi.org/10.1038/s41432-021-0150-x
15. Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol. 2008 Apr;61(4):344-9. https://doi.org/10.1016/j.jclinepi.2007.11.008
16. Asociación Latinoamericana de Odontopediatría. Tratamiento de la enfermedad caries em época de COVID-19: protocolos clínicos para el control de aerosoles. S. l.: Asociación Latinoamericana de Odontopediatría; 2020.
17. World Dental Federation. Minimal intervention dentistry (MID) for managing dental caries. Geneva: World Dental Federation; 2016 [cited 2021 Jun 30]. Available from: https://www.fdiworlddental.org/minimal-intervention-dentistry-mid-managing-dental-caries
18. Tikhonova S, Jessani A, Girard F, Macdonald ME, De Souza G, Tam L, et al. The Canadian Core Cariology Curriculum: outcomes of a national symposium. J Dent Educ. 2020 Nov;84(11):1245-53. https://doi.org/10.1002/jdd.12313
19. Martignon S, Marín LM, Pitts N, Jácome-Liévano S. Consensus on domains, formation objectives and contents in cariology for undergraduate dental students in Colombia. Eur J Dent Educ. 2014 Nov;18(4):222-33. https://doi.org/10.1111/eje.12091
20. Cortés-Martinicorena FJ, Ceballos L, Martínez-Pérez E, Hernández-Juyol M, Schulte AG, Almerich-Silla JM, et al. Spanish curriculum on cariology for undergraduate dental students: proceedings and consensus. Eur J Dent Educ. 2021 Jun;26(2):317-28. https://doi.org/10.1111/eje.12706
21. Gouvea DB, Groisman S, Bönecker MJ, Sampaio F, Paiva SM, Kruger L, et al. Cariology education for undergraduate Brazilian dental students. Rev Gaúcha Odontol 2018;66(3). https://doi.org/10.1590/1981-86372018000300073428
22. Associação Brasileira de Odontopediatria. Prevenção e controle da cárie dentária. Rio de Janeiro: Santos; 2020. Dretrizes para procedimentos clínicos em odontopediatria, p. 77-102.
23. Walsh T, Worthington HV, Glenny AM, Marinho VC, Jeroncic A. Fluoride toothpastes of different concentrations for preventing dental caries. Cochrane Database Syst Rev. 2019 Mar;3(3):CD007868. https://doi.org/10.1002/14651858.CD007868.pub3
24. Early childhood caries: IAPD Bangkok Declaration. Int J Paediatr Dent. 2019 May;29(3):384-6. https://doi.org/10.1111/ipd.12490
25. Schwendicke F, Frencken J, Innes N, editors. Caries excavation: evolution of treating cavitated carious lesions. Basel: Karger; 2018. (Monographs in oral science book, v. 27). https://doi.org/10.1159/000487843
26. Antonioni MB, Fontana M, Salzmann LB, Inglehart MR. Pediatric dentists' silver diamine fluoride education, knowledge, attitudes, and professional behavior: a national survey. J Dent Educ. 2019 Feb;83(2):173-82. https://doi.org/10.21815/JDE.019.020
27. Hesse D, Bonifácio CC, Mendes FM, Braga MM, Imparato JC, Raggio DP. Sealing versus partial caries removal in primary molars: a randomized clinical trial. BMC Oral Health. 2014 May;14(1):58. https://doi.org/10.1186/1472-6831-14-58
28. Moraes RR, Correa MB, Daneris A, Queiroz AB, Lopes JP, Lima GS, et al. Email Vs. Braz Dent J. 2021 Jan-Feb;32(1):67-77. https://doi.org/10.1590/0103-6440202104291