

Introduction

Childhood decay is the most common childhood disease despite being completely preventable. Early Childhood Caries (ECC) is a type of caries that occurs on primary teeth and is defined as the presence of one or more decayed (non-cavitated or cavitated), missing (as a result of caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger (7). The etiology of ECC is complex in nature and multifactorial. ECC has been found to have severe consequences on the quality of life of children. In children that had pain associated with ECC, three-fourths of those children were not able to eat, a third were unable to sleep, a quarter unable to play, and a tenth unable to attend school (4). Prevention of ECC and management of white spot lesions is critical. This can be done through caries risk assessment, oral hygiene instruction, diet counseling, and application of fluoride varnish every three months. With compliance and follow up from parents, restoration can be avoided (2). However, most dentists see children for the first time at the dentist when ECC is in advanced stages. When carious lesions have already occurred, their management is key in improving the quality of life of school children.

Anterior primary teeth caries present many challenges to treatment. Most children who exhibit caries on anterior primary teeth are very young in age (on average it begins from 18-36 months in age). At this age children lack the cognitive ability to cooperate, and their behavior needs to be considered for treatment options. High caries risk children are often a part of a low socio-economic class and face barriers to care such as cost of treatment and difficulty with consistent follow up and preventative care (6). Other factors that present a challenge in managing anterior primary teeth caries include the small teeth size which means there is minimal surface area for bonding and a proximity between teeth pulp and surface (7).

Treatment on primary anterior teeth caries can range from preventative techniques, atraumatic restorative treatment, restorations with a range of different materials, pulpal therapy, and extractions. It is important to note that there is a newer method to obtaining caries control with the use of Silver Diamine Fluoride (SDF). SDF works by forming a squamous layer on the exposed dentin and partially plugging the dentinal tubules. The silver compounds arrest caries by interfering with the ability of the pathogens to form a biofilm on the treated surface. It can also encourage remineralization. However, it causes carious lesions to undergo a black color change, which is the biggest barrier to treatment (3). There is not a consistent agreement on guidelines for the selection of materials and techniques in the pediatric dental literature and the choice appears based on the practitioner preference (5). There are many factors to consider when considering which material and treatment choice to go with such as the location and size of the prepared cavities, physical properties of the restorative material, the gender, age, and socioeconomic status of the patient, esthetics, the type of practice, and the clinician's experience (1). While many studies have focused on primary teeth treatment, none have focused solely on anterior primary teeth, one of the first teeth affected by caries.

Objectives

This study aims to identify practitioner's treatment decisions on managing primary anterior teeth caries and restorative techniques on managing primary anterior teeth caries. The goals of this study are:

- To assess treatment modalities available for anterior primary teeth to pediatric dentists
- If years since graduation and type of insurance accepted influence treatment decisions made

Acknowledgements

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Study Design & Methods

This was a cross-sectional study in which data collection occurred over a period one month, March 2023. The target population was pediatric dentists and pediatric dental residents currently in clinical practice. A survey was sent out via email to active American Academy of Pediatric Dentistry (AAPD) members who are either currently practicing pediatric dentistry or in a pediatric dentistry residency program. Study personnel collected the following data on those that completed the survey: AAPD regional district location, years since completing training, and insurance taken at office. The survey questions included topics on identifying caries in anterior primary teeth and caries treatment of anterior primary teeth. The following scenario was used, "A healthy 4 year old patient (dental age 4 years old as well) presents to the office. All primary anterior teeth are fully developed with no radiographic sign of root resorption. Patient is a Frankl 4 (very cooperative) and has never had dental work done before." The survey questions assessed treatment for incipient lesions, vital pulp with carious lesions, and non-vital pulp with carious lesions on anterior primary teeth. Questions on what influences practitioner's decisions were also included.

Survey Responses

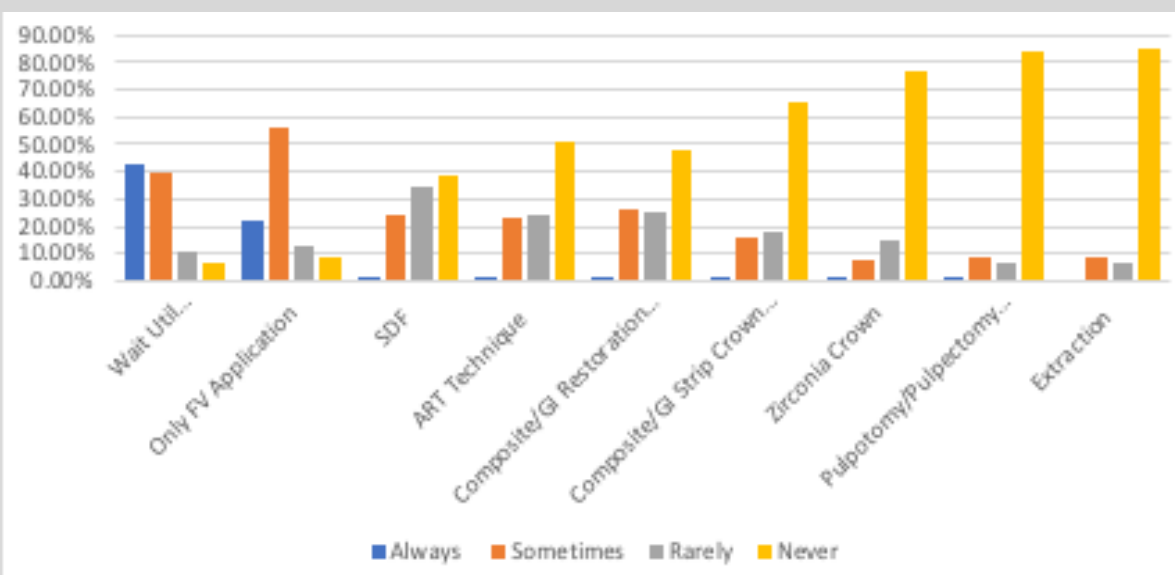


Figure 1
Practitioner's treatment choices on incipient lesions/white spots on anterior primary teeth

	1	2	3	4	5	6	7
Esthetics	3.69%	6.77%	8.31%	15.69%	14.46%	22.46%	28.62%
Behavior	15.38%	30.15%	18.46%	16.31%	14.15%	3.08%	2.46%
Parental Preference	3.38%	7.08%	12.00%	12.92%	17.23%	27.08%	20.31%
Size of lesion/how many tooth surfaces	54.46%	19.69%	13.23%	7.38%	4.00%	0.92%	0.31%
Caries Risk Assessment	12.00%	16.62%	17.23%	16.00%	15.38%	17.54%	5.23%
Overall Oral Hygiene	1.23%	3.38%	14.15%	17.54%	21.23%	18.77%	23.69%
Age	9.85%	16.31%	16.62%	14.15%	13.54%	10.15%	19.38%

Figure 2
Practitioner's influences for treatment on incipient lesions/white spots on anterior primary teeth

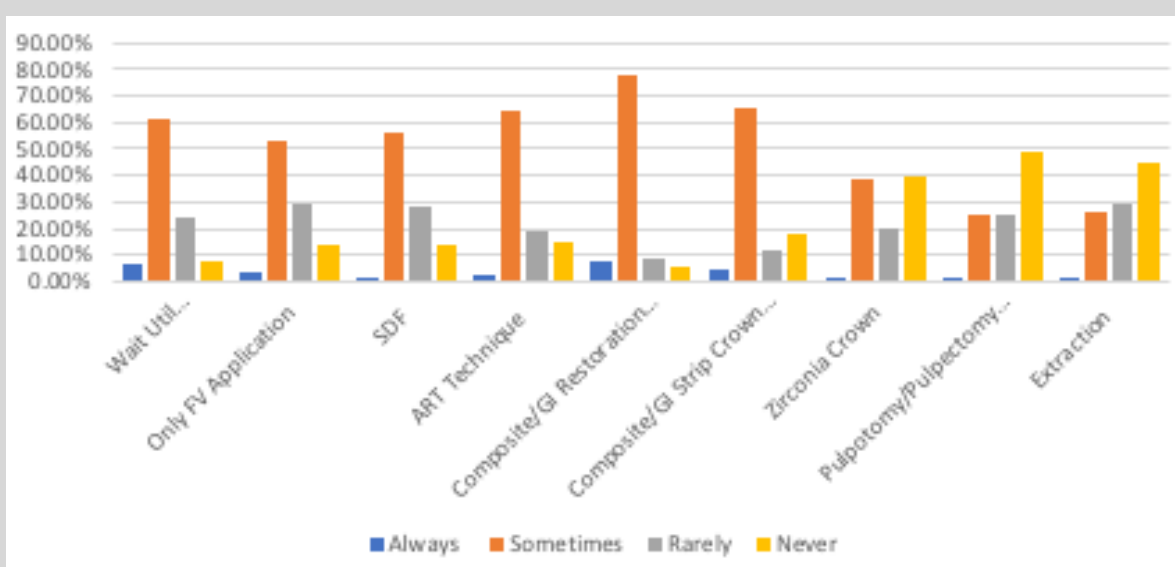


Figure 3
Practitioner's treatment choices on vital pulp carious/cavitated lesions on anterior primary teeth

	1	2	3	4	5	6	7	TOTAL	SCORE
Esthetics	4.88%	6.23%	5.69%	10.84%	13.55%	21.95%	36.86%	369	2.65
Behavior	12.74%	18.70%	20.60%	20.33%	15.18%	8.67%	3.79%	369	4.52
Parental Preference	3.79%	5.42%	13.55%	11.92%	15.18%	28.73%	21.41%	369	2.99
Size of lesion/how many tooth surfaces	46.34%	22.22%	12.20%	8.67%	6.50%	3.25%	0.81%	3	5.80
Caries Risk Assessment	17.62%	23.58%	15.45%	15.18%	14.09%	8.94%	5.15%	19	4.68
Overall Oral Hygiene	1.08%	8.13%	18.70%	17.07%	20.87%	19.51%	14.63%	54	3.34
Age	13.55%	15.72%	13.82%	15.99%	14.63%	8.94%	17.34%	64	4.01

Figure 4
Practitioner's influences for treatment on vital pulp carious/cavitated lesions on anterior primary teeth

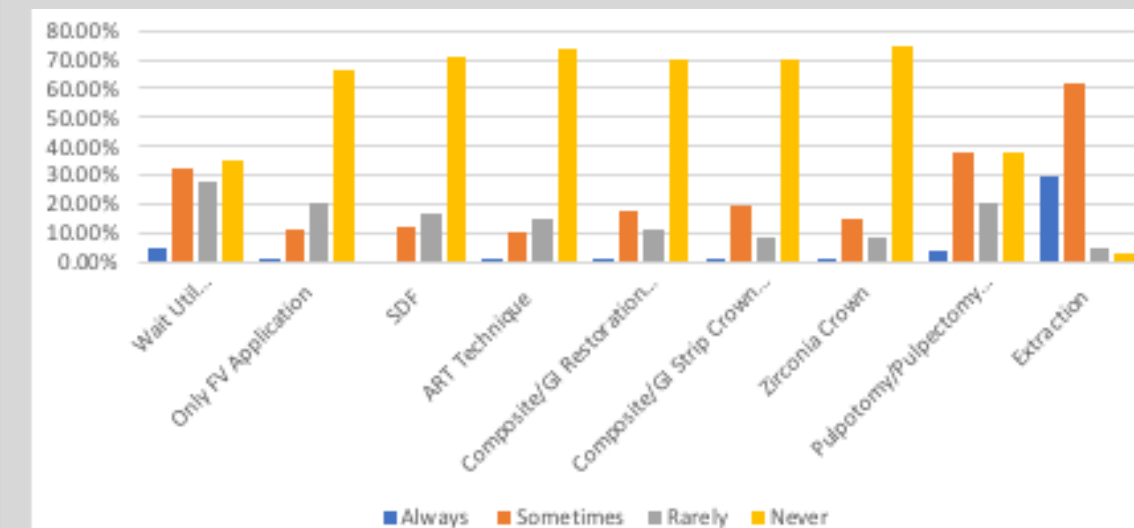


Figure 5
Practitioner's treatment choices on non-vital pulp carious/cavitated lesions on anterior primary teeth

	1	2	3	4	5	6	7
Esthetics	4.88%	8.01%	8.01%	12.89%	14.63%	18.82%	32.75%
Behavior	16.72%	33.10%	18.82%	16.03%	8.71%	4.88%	1.74%
Parental Preference	8.71%	7.32%	15.33%	18.82%	14.29%	19.86%	15.68%
Size of lesion/how many tooth surfaces	47.04%	18.47%	11.15%	11.85%	5.92%	3.83%	1.74%
Caries Risk Assessment	9.41%	14.98%	14.29%	17.77%	23.00%	14.63%	5.92%
Overall Oral Hygiene	0.70%	5.23%	9.41%	10.10%	24.04%	27.87%	22.65%
Age	12.54%	12.89%	23.00%	12.54%	9.41%	27.87%	19.51%

Figure 6
Practitioner's influences for treatment on non-vital pulp carious/cavitated lesions on anterior primary teeth

Results

A total of 505 responses were received, with 285 pediatric dentists fully completing the survey. 61 (13%) respondents are currently in residency, 121 (25%) have graduated residency 1-5 years ago, 60 (13%) have graduated 10-20 years ago, and 160 (33%) graduated over 20 years ago. 65 (14%) stated they work in a hospital setting, 114 (24%) stating they work with government provided insurance, 83 (17%) with fee for service, and 216 (45%) with private insurance. 434 (93%) of respondents agreed white spot lesions are the first signs of tooth decay. 373 (80%) of respondents disagreed that caries into dentin and/or cavitated lesions always require restorative treatment. 422 (97%) of respondents agree that incipient lesions are confined to enamel and can be remineralized.

A descriptive summary of selected characteristics is summarized as frequencies and percentages. Associations between years of practice and usage of SDF as well as association between insurance and usage of Pulpotomy / Pulpectomy were assessed using approximate Person Chi-Squared test via Monte Carlo simulation with N=9999 resampling. In all analyses, statistical significance is claimed at a computed p-value ≤ 0.05 (i.e., result shown in Table 1 is statistically significant). There is a statistically significant association between years of practice and SDF use ($p = 0.007$). Practitioners in their early years of practice tend to use SDF relatively more frequently. There is not a statistically significant association between insurance and use of Pulpotomy / Pulpectomy ($p = 0.5633$).

Results

Outcome	Years in Practice			p-value ²
	0-10 years N = 241 (50%) ¹	10-20 years N = 77 (16%) ¹	20+ years N = 160 (33%) ¹	
Frequency of SDF Use				0.007
Always	4 (2.5%)	0 (0%)	0 (0%)	
Sometimes	102 (64%)	30 (54%)	49 (45%)	
Rarely	37 (23%)	15 (27%)	39 (35%)	
Never	16 (10%)	11 (20%)	22 (20%)	

¹n (%)
²Approximative Pearson Chi-Squared Test (Monte Carlo, N=9999)

Outcome	Insurance				p-value ²
	Hospital Setting N = 65 (14%) ¹	Government provided insurance N = 114 (24%)	Fee for service N = 83 (17%)	Private insurance N = 216 (45%)	
Frequency of Pulpotomy / pulpectomy					0.5633
Always	0 (0%)	3 (4.7%)	4 (9.8%)	4 (2.7%)	
Sometimes	15 (43%)	23 (36%)	14 (34%)	55 (37%)	
Rarely	9 (26%)	12 (19%)	10 (24%)	31 (21%)	
Never	11 (31%)	26 (41%)	13 (32%)	57 (39%)	

¹n (%)
²Approximative Pearson Chi-Squared Test (Monte Carlo, N=9999)

Table 1
Association between years in practice and SDF Use

Table 2
Association between insurance and pulpotomy/pulpectomy use

Discussion

Majority of respondents agreed that incipient lesions were the first signs of tooth decay and can be remineralized. With that being said, the most popular treatment method for incipient lesions is to monitor until exfoliation or applying fluoride varnish. Most providers did not treat incipient lesions with restorative treatment or extraction. Treatment of carious/cavitated lesions with vital pulp on anterior primary teeth showed a wide range of treatment decisions. Composite/GI restorations, ART, SDF, monitoring until exfoliation, and FV application every 3 months were all popular decisions. SDF was found to be used for carious, vital lesions more frequently by those in practice for fewer years. This may be attributed to SDF being a newer caries arresting agent. Treatment for carious lesions with non-vital pulp were rarely treated similarly to those with vital pulp. Extraction was the most popular treatment decision, with pulpotomy/pulpectomy with an esthetic restoration and waiting until exfoliation also showing popularity. This decision was not associated with the type of insurance/payment the practitioner would gain. Waiting until exfoliation on a primary incisor of dental age 4 was surprising as the AAPD guidelines state treatment options for nonvital pulp teeth as pulpectomy, pulpotomy with LSTR, or extraction. Progression of caries on a non-vital tooth can cause pain, infection, and swelling. Regardless of the type of lesion present, the size of the lesion/how many surfaces was the most popular influence in treatment decision. Behavior and caries risk assessment were also popular influences in decision making. Esthetics was not a strong influence which could be why use of SDF was common.

Limitations of the study include small sample size, unanswered questions, and possible author error in entering data. Despite the limitations, it is apparent that most providers gear towards making conservative treatment decisions. Future studies can show the success of these treatments decisions. Future studies can show associations between treatment options and the practitioner's influence to do that treatment using Person Chi-Squared test.

References

- Ahamed, A & Jeevanandan, Ganesh. (2019). A survey among dentists treating pediatric patients about management of caries and opinion on various restorative modalities. *Drug Invention Today*, 11, 81-86.
- Altari, N., & Roberts, J. F. (2004). Restoration of primary teeth affected by Early Childhood Caries. *European journal of paediatric dentistry*, 5(2), 92-97.
- Bagher, S. M., Sabbagh, H. J., AlUohani, S. M., Alharbi, G., Aldajani, M., & Elkhodary, H. (2019). Parental acceptance of the utilization of silver diamine fluoride on their child's primary and permanent teeth. *Patient preference and adherence*, 13, 829-835. <https://doi.org/10.2147/PPA.S205686>
- Finucane D. (2012). Rationale for restoration of carious primary teeth: a review. *European archives of paediatric dentistry : official journal of the European Academy of Paediatric Dentistry*, 13(6), 281-292. <https://doi.org/10.1007/BF03202828>
- Halawany, H. S., Salama, F., Jacob, V., Abraham, N. B., Mobarik, T., Alazmah, A. S., & Al Harbi, J. A. (2017). A survey of pediatric dentists' caries-related treatment decisions and restorative modalities - A web-based survey. *The Saudi dental journal*, 29(2), 66-73. <https://doi.org/10.1016/j.sdent.2017.03.001>
- Waggoner W. F. (2002). Restoring primary anterior teeth. *Pediatric dentistry*, 24(5), 511-516.
- Zou, J., Du, Q., Ge, L. et al. Expert consensus on early childhood caries management. *Int J Oral Sci* 14, 35 (2022). <https://doi.org/10.1038/s41368-022-00186-0>