Provider Perspectives on Silver Diamine Fluoride as a Modality of Treatment for Carious Lesions of Anterior Primary Teeth

Annie Herman Perel, DMD, Nuntiya Kakanantadilok, DMD
Albert Einstein College of Medicine/Montefiore Medical Center, Bronx, NY

Introduction

Dental caries is one of the most prevalent chronic diseases in childhood. In recent years, there has been a shift from traditional "drill-and-fill" techniques towards more minimal-intervention, evidence-supported treatment options.[1] One of these minimally invasive alternatives is the use of Silver Diamine Fluoride (SDF). SDF is a clear, odourless liquid that combines the antibacterial effects of silver and the remineralizing effects of fluoride, providing a promising therapeutic agent for arresting caries lesions. [2] Some of the advantages of SDF, includes that it is minimally invasive and does not require caries removal prior to placement. It is easy to apply, requiring minimal instrumentation and isolation. Another of it's advantages is that it is a non-aerosolizing procedure, allowing its application to reduce the risk of transmission of acute respiratory infections (such as COVID-19).[2] Due to its easy application, it can also be used in patients with special needs, medical complexities or behavioral challenges. SDF is also very inexpensive. Its cost effectiveness makes it a very favorable treatment for children in underserved areas, limited access to care or patients from low socio-economical backgrounds. Overall, SDF has been proven as a safe, effective and inexpensive treatment option for caries arrest of young children.

The only apparent drawback of SDF is that it causes black discoloration in the carious enamel and dentin. The discoloration of the teeth affects the esthetic appearance of a child, and thus it is perceived that many parents would refuse the treatment option especially in the esthetic areas. In previous studies examining the providers perspectives of SDF as an effective treatment option for caries arrest, it was found that providers perceived the larger barrier for parents and child's acceptance to be the unaesthetic permanent discoloration that it causes.[2] However, many studies have shown significant higher acceptance rates for SDF as a treatment option when the patients are extremely young, medically complex or behaviorally challenged. Although staining of teeth is undesirable, most parents preferred this option to advanced behavioral techniques such as sedation or general anesthesia.[3] Due to the esthetic implications, many pediatric dental providers may refrain from presenting SDF as an alternative treatment option for caries arrest in anterior teeth. The largest perceived barrier to the use of SDF is the concern of parental acceptance.[4] However, several trials have stressed that in their results, anterior teeth have much higher rates of arrest than posterior teeth.[5] It was shown that 38% SDF solution was more effective in hardening or arresting dentin caries in upper anterior primary teeth than the application of a 5% NaF varnish at three months intervals or a placebo.[6] For this reason practitioners should present SDF as an alternative treatment option before more invasive methods are considered. [7]

Objectives

The primary aim of this study was to evaluate the perspective of the U.S. pediatric dentists towards the use of Silver Diamine Fluoride (SDF) as a modality of treatment for active carious lesions on primary anterior teeth.

The secondary aim of this study is to evaluate whether there are differences in use of SDF for primary anterior teeth depending on the years of experience of the provider and the type of reimbursement for the practice.

Hypothesis

- Recent graduates are more likely to offer SDF as a treatment option for primary anterior teeth.
- Recent graduates are less likely to be dissuaded from offering SDF despite the esthetic implications (dark discoloration of teeth).
- Practitioners whose primary reimbursement is government funded insurances (Medicaid) are more likely to offer SDF for primary anterior teeth.

Study Design

The study was conducted as a cross-sectional national survey. A recruitment email was sent to all members of the American Academy of Pediatric Dentistry (AAPD).

Data was analyzed to determine if correlations existed between SDF application and years of experience, esthetic implications and primary type of reimbursement.

Figure 1

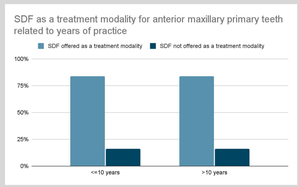


Figure 2

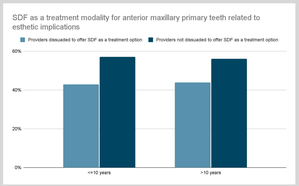
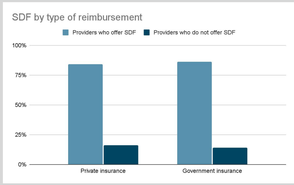


Figure 3



Results

A total of 8062 surveys were sent out and 518 responses were obtained. The response rate was 6.4%. Most of the participants reported to be board certified (65.9%). The majority of providers graduated within the last 10 years (50.1%). Most of the responders worked in a group practice (44.4%), followed by solo practice (31.7%), hospital setting (11.4%) and university affiliated institutions (6.0%). The majority of responders worked in a suburban setting (59.1%), followed by urban settings (29.9%) and rural settings (11.0%). The primary type of reimbursement was reported to be private insurance (53.3%) followed by government funded insurance (43.2%), self-pay (1.9%) and other (1.6%).

The vast majority of providers (83.9%) reported that they offer SDF as a treatment modality for carious lesions on primary anterior teeth regardless of years in practice (Figure 1). Among these providers SDF was offered to healthy patients with severe dental anxiety, patients with special health care needs such as developmental disabilities and behavioral problems, patients with complex medical problems and significant physical limitations; and patients with financial constraints. There was no specific age restriction or limitation for the patients who were offered SDF as a treatment modality for carious lesions on primary anterior teeth.

The majority of providers (56.6%) reported that SDF discoloration did not dissuade them from offering SDF as a treatment modality for carious lesions on primary anterior teeth regardless of years in practice (Figure 2). The type of reimbursement did not affect the providers' decision to offer SDF as a treatment modality for primary maxillary anterior teeth (Figure 3).

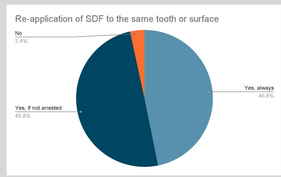
The majority of providers reported that they reapplied SDF to the same tooth or surface (96.6%). Among them, 46.8% of the providers always re-apply SDF regardless of caries arrest, while 49.8% reapply it only if the caries are not arrested. A small minority of 3.4% reported that they do not re-apply SDF regardless of caries arrest (Figure 4). Among the providers that re-apply SDF the most popular interval for reapplication was between 1-6 months after initial placement with 298 responders (60.6%). This is followed by less than 1 month reapplication 29.9% and more than 6 months with 9.6% of responders (Figure 5).

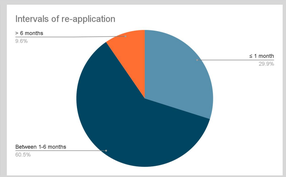
Discussion

SDF has shown to be a very useful method for caries arrest of primary anterior maxillary teeth. Its cost-effectiveness, easiness of application, minimal invasive and effectiveness make it an attractive treatment modality for patients of all demographics, ages and backgrounds.

Based on the results of this study, providers are not likely to be dissuaded by the dark discoloration of SDF, and are likely to offer it as a treatment modality for primary anterior maxillary teeth despite its esthetic implications. Regarding the relationship between the use of SDF and the years of practice, use of SDF was not associated with years of practice. The type of reimbursement did not affect the providers' decision to offer SDF as a treatment modality for primary maxillary anterior teeth. All of the hypothesis on this study were proven to be false.

Figure 4 and Figure 5





Conclusions

The extent of use of SDF by pediatric dentists was 84% with 95% CI (87%, 80%). The use of SDF by pediatric dentists was not associated with years of practice and type of reimbursement (Figure 1 and 3). Recent graduates were not dissuaded from offering SDF despite the esthetic implications (Figure 2). Estimates are percentages and corresponding 95% confidence intervals (CI). Comparison between groups is carried out using Pearson's Chi-squared test at $\alpha = 0.05$ level (i.e., the associations shown in tables 2, 3 and 4 are not statistically significant).

References

1. Surdu S, Dall TM, Langelier M, Forte GJ, Chakrabarti R, Reynolds RL. The pediatric dental workforce in 2016 and beyond. J Am Dent Assoc. 2019 Jul;150(7):609-617.e5. doi: 10.1016/j.adaj.2019.02.025. Epub 2019 May 29. PMID: 31153549.
2. Seifo N, Cassie H, Radford J, Innes N. "It's really no more difficult than putting on fluoride varnish": a qualitative exploration of dental professionals' views of silver diamine fluoride for the management of carious lesions in children. BMC Oral Health. 2020 Sep 15;20(1):257. doi: 10.1186/s12903-020-01243-y. PMID: 32933507; PMCID: PMC7490474.
3. Crystal YO, Janal MN, Hamilton DS, Niederman R. Parental perceptions and acceptance of silver diamine fluoride staining. J Am Dent Assoc. 2017;148(7):510-518.e4. doi:10.1016/j.adaj.2017.03.013
4. Sabbagh H, Othman M, Khogeer L, Al-Harbi H, Al Harthi A, Abdulgader Yaseen Abdulgader A. Parental acceptance of silver Diamine fluoride application on primary dentition: a systematic review and meta-analysis. BMC Oral Health. 2020 Aug 20;20(1):227. doi: 10.1186/s12903-020-01195-3. PMID: 32819333; PMCID: PMC7439720.
5. Gao SS, Zhao IS, Hiraishi N, Duangthip D, Mei ML, Lo ECM, Chu CH. Clinical Trials of Silver Diamine Fluoride in Arresting Caries among Children: A Systematic Review. JDR Clin Trans Res. 2016 Oct;1(3):201-210. doi: 10.1177/2380084416661474. Epub 2016 Aug 20. PMID: 30931743.
6. Chu CH, Lo EC, Lin HC. Effectiveness of silver diamine fluoride and sodium fluoride varnish in arresting dentin caries in Chinese pre-school children. J Dent Res. 2002 Nov;81(11):767-70. doi: 10.1177/0810767. PMID: 12407092.
7. Boka V, Arapostathis K, Vretos N, Kotsanos N. Parental acceptance of behaviour-management techniques used in paediatric dentistry and its relation to parental dental anxiety and experience. Eur Arch Paediatr Dent. 2014;15(5):333–339.