Investigation

Longitudinal effectiveness of silver diamine fluoride on caries lesions in adults

A retrospective study using a dental school database

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ABSTRACT

Background. Silver diamine fluoride (SDF) is used to treat caries lesions in primary teeth in children and has been found to be effective. Older adults may also benefit from the use of SDF in treating initial coronal or root caries lesions, yet such studies are lacking. The authors aimed to determine the factors related to the longevity of adult patients' teeth after SDF treatment.

Methods. Data were obtained from the AxiUm database of the College of Dentistry, University of Iowa. Patients 18 years and older who underwent SDF treatment from January 1, 2016, through December 31, 2021, were included. Patient variables included demographic characteristics, medical history, tobacco use, and total number of SDF treatments. The tooth variables included tooth number, number of SDF applications, and any subsequent treatment. The outcome was tooth survival, defined as no need for subsequent treatment and no need for root canal or extraction. The analyses included χ^2 tests, Cox survival models, and Kaplan-Meier curves.

Results. The analysis included 1,772 patients and 2,985 SDF-treated teeth. Tobacco use was linked to more subsequent treatments, whereas multiple SDF applications reduced them. Teeth with preexisting crowns were more likely to require root canal therapy or extraction.

Conclusions. In adults, the application of SDF more than once increased the longevity of teeth. Tobacco use was associated with an increased chance of a tooth having subsequent treatment (eg, restoration, extraction, and root canal therapy) after SDF application.

Practical Implications. Repeated SDF applications may enhance tooth survival in adults, although tobacco use and existing crowns could reduce SDF effectiveness.

Key Words. SDF; silver diamine fluoride; caries; teeth longevity.

JADA 2025:■(■):■-■
https://doi.org/10.1016/j.adaj.2025.11.010

Caries represents a major global health burden that affects populations across all age groups.[1] Much of the research and clinical focus has been centered on pediatric populations in which untreated caries can lead to pain, infection, and substantial developmental challenges.[2] However, researchers presenting emerging evidence underscored that adults, especially the aging population, are increasingly vulnerable, and root caries lesions present an often overlooked clinical challenge.[3] It has been suggested that nearly 21.3% of adults in the United States have untreated caries.[3] As people age, they may experience gingival recession, decreased salivary flow, and dietary factors that contribute to the exposure and subsequent caries of the root surfaces. Root caries lesions often progress quickly, are difficult to restore, and complicate the maintenance of oral health.[4,5]

Fluoride has long been recognized as a cornerstone in the prevention and management of caries. Fluoride can be administered through water fluoridation, supplements, dentifrices, mouthrinses, gels, prescription toothpastes, varnishes, or restorative materials.[6] Conventional fluoride treatments primarily strengthen the tooth structure and inhibit demineralization. However, they do not directly address the bacterial colonization that drives progression of caries lesions.

In contrast, silver diamine fluoride (SDF) offers distinct advantages over traditional fluoride treatments. It has a dual-action approach, combining potent antibacterial effects with fluoride-induced remineralization to actively arrest caries progression. SDF delivers fluoride ions that transform hydroxyapatite into more caries-resistant fluorapatite and incorporates silver ions, which exhibit potent antibacterial properties.[7,8] Furthermore, when applied, SDF interacts with softened dentin to form an insoluble precipitate of silver phosphate, effectively sealing the lesion and inhibiting further bacterial colonization.[9,10] This dual mechanism is advantageous in the management of root caries in adults, where the exposed dentin is more susceptible to rapid demineralization, and conventional fluoride treatments may not provide the same long-term protection as SDF.[11] The ability of SDF to both arrest active caries and promote remineralization makes it a promising, minimally invasive alternative that could extend the longevity of natural dentition in older adults.[12,13]

In clinical studies, researchers consistently have found 38% SDF to be effective in halting caries progression in children, making it particularly valuable for young patients, those with behavioral challenges, and children with special health care needs.[14] Moreover, emerging clinical evidence supports the use of SDF in adults, as it can effectively arrest both coronal and root caries, thereby offering a conservative alternative to tooth extraction.[15] In addition, SDF is a low-cost, noninvasive treatment that is easy to apply, which makes it an attractive first-choice treatment for underserved populations; those who are medically compromised, including low-income patients; and those in rural or care facility settings with limited access to oral health care services. These advantages often outweigh the drawback of SDF causing black staining of the caries dentin, which can compromise esthetics.[16]

The American Dental Association introduced the *CDT 2016: Current Dental Terminology* code for caries arrest (D1354)[17] effective January 1, 2016, which has facilitated the collection of clinical data on the use of SDF in routine practice.[18] This development underscores the growing recognition of SDF as a valuable tool in not only pediatric dentistry but also in the management of adult caries, particularly in patients for whom conventional restorative treatments pose challenges.[19,20] The broader public health significance of SDF is further highlighted by means of its inclusion in the World Health Organization's list of essential health system medicines in 2021.[21]

There is evidence supporting the use of SDF in children.[22,23] There remains a clear gap in the understanding of the long-term effectiveness of SDF on the survival of teeth treated with SDF in the adult population. In addition, there may be tooth- or patient-based factors that affect the longevity of SDF-treated teeth.[22] For instance, researchers have suggested that the effectiveness of SDF is closely linked to maintaining good oral hygiene; without proper oral health care the treatment may fail to arrest existing lesions or prevent new caries from developing.[24] However, the influence of other patient factors and tooth conditions on the survival of SDF-treated teeth remains understudied.

Our aim in this retrospective study was to examine the survival of SDF-treated teeth in adult patients, considering both tooth- and patient-related factors. In doing so, we sought not only to determine the durability of SDF's effects in an adult population but also to provide a more nuanced understanding of its role in the management of caries in adults.

METHODS

We analyzed data extracted from the electronic health records (EHRs) at the University of Iowa College of Dentistry (UICOD) and Dental Clinics. Ethical approval for this study was obtained from the institutional review board of the UICOD (IRB-01202104543). The inclusion criteria encompassed patients 18 years and older who underwent at least 1 SDF application identified using *CDT 2016: Current Dental Terminology* code D1354[17] from January 1, 2016, through December 31, 2021. Patients treated with SDF from 2014 through 2016 were identified in 2016 and followed

ABBREVIATION KEY

CRA: Caries risk assessment.
EHR: Electronic health record.
SDF: Silver diamine fluoride.
UICOD: University of Iowa College of Dentistry.

through 2021. To be confident in capturing all data from patients who routinely sought care at UICOD, patients were required to have at least 1 recall visit or examination appointment from 2 years before the initial treatment with SDF placement. To evaluate the longevity of SDF-treated teeth, demographic and longitudinal clinical data, including tooth-site treatment procedures and dates were collected. The variables were categorized as tooth- or patient-specific.

Survival and failure were classified into 2 types. Type 1 survival was defined as the SDF-treated tooth not having any subsequent treatment (ie, restorations, root canal therapy, or extraction), not including additional SDF applications or other preventive treatment. Conversely, type 1 failure was defined as SDF-treated tooth that required subsequent treatment, such as restorations, root canal therapy, or extraction. Type 2 survival was defined as the SDF-treated tooth not having root canal therapy or extraction; conversely, type 2 failure was defined as the SDF-treated tooth having root canal therapy or extraction.

Data analysis was performed using SPSS software, Version 27 (IBM Corp). Descriptive frequency statistics were calculated and χ^2 tests were used to evaluate the associations between categorical variables. Furthermore, post-SDF treatment longevity was analyzed using Cox proportional hazards survival analysis models and Kaplan-Meier survival curves.

RESULTS

We included 1,772 adult participants in our study; 2,985 teeth were treated with SDF (Table 1). Participants were aged 18 through 104 years; the age group including those 75 years and older had the highest proportion (34.3%) of participants. The sex distribution was nearly equal (50.7% male) and, in terms of race, most participants identified as White (78.7%). Nearly equal proportions of the population had government insurance (36.7%) and were self-pay (36.5%), and a smaller proportion had private insurance (26.8%). Participants reported taking as many as 41 medications; 14.7% took no medications, and 29.9% took from 1 through 4 medications. Furthermore, from the completed records, most patients did not have special health care needs (90.1%), did not undergo chemotherapy or radiation therapy (94.0%), and did not report experiencing dry mouth (75.0%). In terms of medical conditions or health-related issues, more than one-half of patients did not use tobacco (61.8%), had no breathing problems (66.6%), or had no mental health issues (60.7%). However, most of the participants reported heart disease or blood pressure problems (61.5%). More than one-half of the patients (64.7%) had only 1 tooth treated with SDF (Table 1). Only 17.2% of the teeth included had crowns present at the initial SDF treatment. Most teeth received a single SDF application (71.4%), and 28.6% received 2 or more applications.

Of the 617 patients with completed caries risk assessment (CRA) forms, most were classified as having high or moderate caries risk (90.3%) (Table 1). From those who completed the CRA forms, 31.9% reported drinking sugar-sweetened beverages daily, 15.4% consumed more than 20 oz per day, and 22.0% drank beverages for longer than 30 minutes at a time. In the prior 36 months, 68.9% had teeth extracted due to caries. A high plaque index score (> 1.0) was recorded for 54.1% of the participants.

The bivariate analyses examined the 2 failure types, and the results showed significant associations with older age groups (ie, 36-64 years and 65-74 years) compared with other age groups (type 1 failure: $P = .008$, type 2 failure: $P = .004$). In addition, White patients had a higher likelihood of failure compared with other races for both failure types (type 1 failure: $P < .001$, type 2 failure: $P = .010$). Furthermore, type 1 failure was influenced by means of tobacco use ($P = .002$) and type 2 failure had a significant association with private insurance or self-pay status ($P = .040$) (Table 2).

Table 3 contains the results of the bivariate analyses for tooth variables and both type 1 failure and type 2 failure. For type 1 failure, teeth with crowns at the initial treatment with SDF had higher failure rates ($P < .001$) and anterior teeth exhibited a significantly higher failure rate compared with posterior teeth ($P < .001$). Similarly, for type 2 failure, teeth with crowns at the initial treatment with SDF again had higher failure rates ($P < .001$) and anterior teeth had a slightly less significant, but still notably higher, failure rate than posterior teeth ($P = .009$).

Cox proportional hazards survival analysis was conducted with a random effect repeatedly for patients to examine the factors influencing type 1 failure and type 2 failure (Table 4). For type 1 failure, the final model included 2 variables: tobacco history (yes, no) and the number of SDF applications per site (1 vs ≥ 2). The results indicated that having a history of tobacco use increased the hazard of a tooth failing by a factor of 1.48 (95% CI, 1.16 to 1.87; $P = .0013$), or 48%. This

Table 1. Patient-level and tooth-level variables.*

VARIABLE	TOTAL, NO. (%)	FROM COMPLETE RECORDS,† %
Patient Level		
Age group, y		
18-25	107 (6.0)	NA‡
26-35	144 (8.1)	NA
36-64	581 (32.8)	NA
65-74	333 (18.8)	NA
≥75	607 (34.3)	NA
Sex		
Missing	1 (0.06)	NA
Female	873 (49.3)	NA
Male	898 (50.7)	NA
Race		
Other	325 (18.3)	NA
White	1,447 (81.7)	NA
Insurance type		
Government or agencies	598 (33.7)	NA
Private insurance	518 (29.2)	NA
Self-pay	656 (37.0)	NA
Teeth treated with SDF§ per patient, no.		
1	1,146 (64.7)	NA
≥2	626 (35.3)	NA
Tobacco use¶		
Missing	211 (11.9)	NA
Do not know	26 (1.47)	1.7
No	965 (54.45)	61.8
Yes	570 (32.18)	36.5
Heart disease or blood pressure problem		
Missing	139 (7.8)	NA
Do not know	12 (0.7)	0.7
No	616 (34.8)	37.7
Yes	1,005 (56.7)	61.5
Breathing or lung problems		
Missing	183 (10.3)	NA
Do not know	8 (0.5)	0.5
No	1,058 (59.7)	66.6
Yes	523 (29.5)	32.9
Mental health issues		
Missing	158 (8.9)	NA
Do not know	9 (0.5)	0.6
No	979 (55.2)	60.7
Yes	626 (35.3)	38.8
Medications, no.		
0	260 (14.7)	NA
1-4	529 (29.9)	NA
5-9	503 (28.4)	NA
≥10	480 (27.1)	NA

* Missing-value percentages are reported for reference only. † Percentages are based on completed records for variables with missing data. ‡ NA: Not applicable. § SDF: Silver diamine fluoride. ¶ Includes smoking, snuff, and chew. # Includes juice, soft drinks, and energy drinks.

Table 1. Continued

VARIABLE	TOTAL, NO. (%)	FROM COMPLETE RECORDS,[†] %
Patient caries risk status		
Missing	1,155 (65.2)	NA
High or moderate	557 (31.4)	90.3
Low	60 (3.4)	9.7
Drinks sugar-sweetened beverages[#] daily		
Missing	1,123 (63.4)	NA
No	442 (24.9)	68.1
Yes	207 (11.7)	31.9
Drinks > 20 oz of sugar-sweetened[#] beverages daily		
Missing	1,124 (63.4)	NA
No	548 (30.9)	84.6
Yes	100 (5.6)	15.4
Drinks beverages for > 30 min		
Missing	1,123 (63.4)	NA
No	506 (28.6)	78.0
Yes	143 (8.1)	22.0
Teeth missing due to caries in past 36 mo		
Missing	1,132 (63.9)	NA
No	199 (11.2)	31.1
Yes	441 (24.9)	68.9
Plaque index score > 1.0		
Missing	1,151 (65.0)	NA
No	336 (19.0)	54.1
Yes	285 (16.1)	45.9
Special health care needs		
Missing	1,128 (63.6)	NA
No	584 (33.0)	90.1
Yes	60 (3.4)	9.3
Chemotherapy or radiation therapy		
Missing	1,123 (63.4)	NA
No	39 (2.2)	6.0
Yes	610 (34.4)	94.0
Severe dry mouth (xerostomia)		
Missing	1,137 (64.1)	NA
No	159 (9.0)	25.0
Yes	476 (26.9)	75.0
Tooth Level (N = 2,985)		
SDF per site, no.		
1	2,131 (71.4)	NA
≥ 2	854 (28.6)	NA
Location		
Anterior	616 (20.6)	NA
Posterior	2,369 (79.4)	NA
Crown before initial treatment with SDF		
No	2,471 (82.8)	NA
Yes	514 (17.2)	NA

Table 2. Bivariate analysis (χ^2 test) for patient-level characteristics: type 1 failure and type 2 failure.

CHARACTERISTIC	TYPE 1 FAILURE, NO. (%) (N = 594)	TYPE 1 SURVIVAL, NO. (%) (N = 1,178)	TOTAL, NO. (N = 1,772)	*P* VALUE	TYPE 2 FAILURE, NO. (%) (N = 144)	TYPE 2 SURVIVAL, NO. (%) (N = 1,628)	TOTAL, NO. (N = 1,772)	*P* VALUE
Age Group, Y								
18-35	65 (25.9)	186 (74.1)	251		8 (3.2)	243 (96.8)	251	
36-64	198 (34.1)	383 (65.9)	581	.008	49 (8.4)	532 (91.6)	581	.004
65-74	131 (39.4)	202 (60.6)	333		38 (11.4)	295 (88.6)	333	
≥ 75	200 (32.9)	407 (67.1)	607		49 (8.1)	558 (91.9)	607	
Insurance Type								
Government	197 (33)	401 (67)	598		35 (5.9)	563 (94.1)	598	
Private	179 (34.6)	339 (65.4)	518	.834	46 (8.9)	472 (91.1)	518	.040
Self-pay	218 (33.2)	438 (66.8)	656		63 (9.6)	593 (90.4)	656	
Race								
Other	76 (23.4)	249 (76.6)	325	< .001	15 (4.6)	310 (95.4)	325	.010
White	518 (35.8)	929 (64.2)	1,447		129 (8.9)	1,318 (91.1)	1,447	
Tobacco Use*								
Missing	59 (24.9)	178 (75.1)	237		8 (3.38)	229 (96.62)	237	
No	305 (31.6)	660 (68.4)	965	.002	78 (8.1)	887 (91.9)	965	.251
Yes	230 (40.4)	340 (59.6)	570		58 (10.2)	512 (89.8)	570	

* Includes smoking, snuff, and chew.

Table 3. Bivariate analysis (χ^2 test) for tooth-level characteristics: type 1 failure and type 2 failure.

CHARACTERISTIC	TYPE 1 FAILURE, NO. (ROW %) (N = 969)	TYPE 1 SURVIVAL, NO. (ROW %) (N = 2,016)	TOTAL, NO. (N = 2,985)	*P* VALUE	TYPE 2 FAILURE, NO. (ROW %) (N = 265)	TYPE 2 SURVIVAL, NO. (ROW %) (N = 2,720)	TOTAL, NO. (N = 298)	*P* VALUE
Silver Diamine Fluoride Applications/ Tooth								
1	680 (31.9)	1,451 (68.1)	2,131	.309	202 (9.5)	1,929 (90.5)	2,131	.068
≥ 2	289 (33.8)	565 (66.2)	854		63 (7.4)	791 (92.6)	854	
Crown Before Silver Diamine Fluoride								
No	770 (31.2)	1,701 (68.8)	2,471	< .001	181 (7.3)	2,290 (92.7)	2,471	< .001
Yes	199 (38.7)	315 (61.3)	514		84 (16.3)	430 (83.7)	514	
Location								
Anterior	240 (39)	376 (61)	616		71 (11.5)	545 (88.5)	616	
Posterior	729 (30.8)	1,640 (69.2)	2,369	< .001	194 (8.2)	2,175 (91.8)	2,369	.009

indicates that people with a history of tobacco use are at higher risk of experiencing tooth failure (or lower survival probability for the tooth). Conversely, applying SDF multiple times to the same site reduced the hazard of failure by a factor of 0.16 (95% CI, 0.13 to 0.2; $P < .0001$), or 84%, indicating that multiple applications significantly improved tooth survival. Figures 1 and 2 contain the Kaplan-Meier survival curves for these variables; a higher line represents a greater likelihood of tooth survival (or lower risk of experiencing a failure).

For type 2 failure, the final model included the presence of crowns (yes, no) and the number of SDF applications per site (1 vs 2 or more). The hazard ratio indicated that having crowns increased the hazard of a tooth failing by a factor of 2.9 (95% CI, 1.85 to 4.54; $P < .0001$) or 190%,

Table 4. Survival analysis.

VARIABLE	COEFFICIENT	HAZARD RATIO	SE	*z* SCORE	*P* VALUE
Type 1 Failure					
Used tobacco	0.3894	1.48	0.1213	3.21	.0013
SDF* per site: ≥ 2	−1.8380	0.16	0.1236	−14.87	< .0001
Type 2 Failure					
Crown before SDF	1.0634	2.9	0.2297	4.63	< .0001
≥ 2 SDF applications	−2.2781	0.10	0.2566	−8.88	< .0001

* SDF: Silver diamine fluoride.

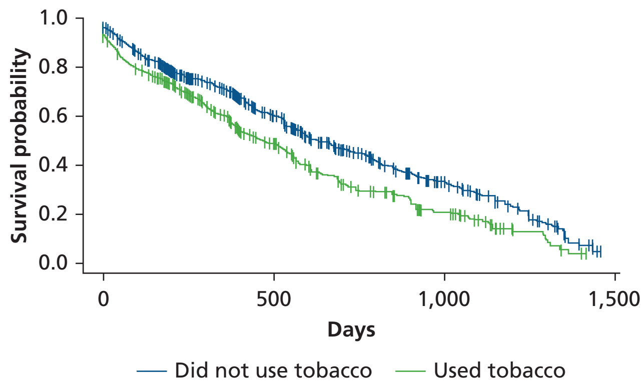

Figure 1. Survival probability of using tobacco (Kaplan-Meier survival curves): type 1 failure. Vertical hashes on the survival curves indicate censored observations.

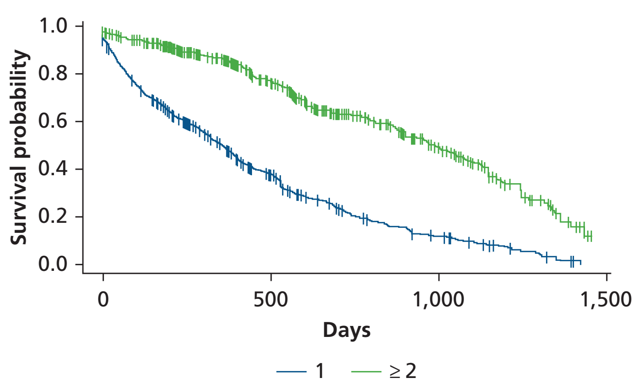

Figure 2. Survival probability for number of silver diamine fluoride treatments (*CDT 2016: Current Dental Terminology* code D1354)[17] (Kaplan-Meyer survival curves): type 1 failure. Vertical hashes on the survival curves indicate censored observations.

indicating that teeth with crowns have a significantly higher risk of experiencing failure (or lower survival probability). Nonetheless, applying SDF multiple times to the same site reduced the hazard of failure by a factor of 0.10 (95% CI, 0.06 to 0.17; $P < .0001$), or 90%, indicating a strong protective effect of repeated SDF applications. Figures 3 and 4 contain the Kaplan-Meier survival curves for these variables.

DISCUSSION

We found that tooth and patient factors significantly influenced the survival of SDF-treated teeth in adults 18 years and older. Specifically, survival without any subsequent treatment had a significant association with a tooth-specific factor (ie, number of SDF applications) and a patient-

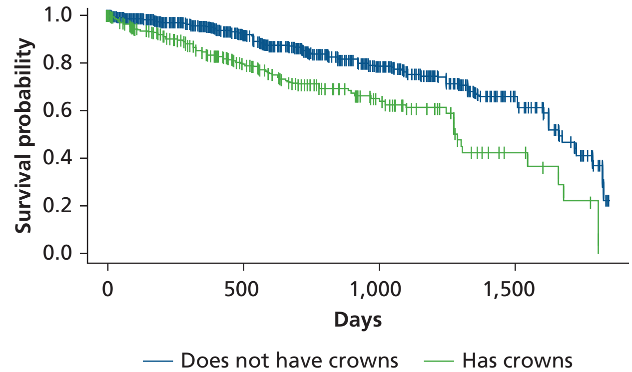

Figure 3. Survival probability of tooth when tooth had a crown (Kaplan-Meyer survival curves): type 2 failure. Vertical hashes on the survival curves indicate censored observations.

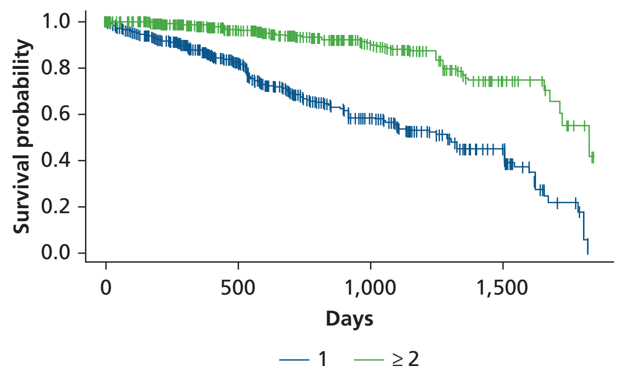

Figure 4. Survival probability of number of silver diamine fluoride treatments (*CDT 2016: Current Dental Terminology* code D1354)[17] (Kaplan-Meyer survival curves): type 2 failure. Vertical hashes on the survival curves indicate censored observations.

related factor (ie, tobacco use). Survival without major subsequent treatment (eg, root canal or extraction) was linked to a tooth-related factor (eg, having a crown before SDF treatment) and more than 1 application of SDF per site. Moreover, these results showed that certain factors, such as the severity of caries, can help predict whether more invasive treatment will be needed after using SDF. This highlights the importance of defining treatment failure on the basis of the need for follow-up procedures.

Therefore, early intervention for initial root caries lesions is crucial to prevent more severe and costly dental problems. There are several noninvasive methods, such as fluoride varnish, SDF, chlorhexidine varnish remineralization therapy, and oral hygiene education, that are used to effectively manage these lesions if detected early.[25,26] Researchers found that SDF was particularly beneficial for a patient with high caries risk and dry mouth in a case series.[27]

We included patients receiving routine care at the UICOD by means of requiring a minimum of 2 years of visits. Participants aged 36 through 64 years and 65 through 74 years had a greater risk of developing both types of failure, and younger adults aged 18 through 35 years had higher success rates. Age appears to play a critical role in the survival of dental interventions, as aging is associated with biological changes, such as accelerated root caries progression and diminished salivary protection, causing dry mouth.[28] Dry mouth, or xerostomia, can result from various factors, including medications, psychological conditions, salivary gland disorders, head and neck radiation, age, and systemic conditions, such as endocrine disorders. The severity of xerostomia often increases with the number of medications prescribed and with age, leading to more complications in oral health, including caries.[29]

Insurance type also influenced outcomes. SDF was associated with better outcomes in patients with government insurance when survival was defined as not having root canal therapy or extraction. Self-pay and privately insured patients had similar follow-up visits but more failures needing root canals or extractions than publicly insured patients. Baseline lesion severity was not recorded. Patients who paid out of pocket may have deferred SDF until lesions were advanced (to avoid the higher cost of root-canal therapy or extraction), whereas government-insured patients could undergo SDF treatment earlier, as part of covered preventive care. The private insurance coverage of SDF is unknown for this population. It has been suggested that patients with government dental insurance in the United States face substantial barriers to accessing oral health care.[30] Moreover, race was another important variable, as White patients had higher failure rates in both type 1 failure and type 2 failure. This could be due to greater access to oral health care and resources in White patients than in non-White patients, leading to more treatment.[31]

CRA is crucial for maintaining oral health and preventing caries, helping clinicians identify high-risk patients and tailor treatment plans.[32] UICOD uses a modified American Dental Association CRA form that focuses on key risk factors, including detailed dietary information, such as daily consumption of sugar-sweetened beverages and other common risk factors, such as a tooth extraction in the past 36 months due to caries, xerostomia, special health care needs, and plaque index score. Although many CRA forms in our study were incomplete, more than 90% of those with a complete CRA form were identified as being at moderate or high risk of developing caries (nearly 35% of all patients). This included a high percentage of participants who consumed sugar-sweetened beverages daily, drank more than 20 oz and for more than 30 minutes, had tooth loss due to caries in the past 36 months, had xerostomia, and had a plaque index score greater than 1.0. These findings are consistent with those from previous studies.[32,33] Moreover, we found that these variables were significantly corelated with tobacco use (drinking > 20 oz of sugar-sweetened beverages daily, $P < .001$, and drinking sugar-sweetened beverages for more than 30 minutes, $P = .003$). Tobacco use has been correlated with a higher caries risk in other studies.[34,35]

We found that the tooth survival rate increased with repeated SDF applications, yet most teeth in our study received only 1 SDF application, indicating that the recommended treatment protocol was not followed. If dental care practitioners had adhered to the biannual application schedule, as several researchers have suggested, the outcomes in terms of tooth survival might have been remarkably different.[14,36-38] These findings underscore the importance of following established protocols to optimize the benefits of SDF treatment in clinical practice.

Our study results indicated that teeth with crowns before SDF treatment had a higher failure rate than those without crowns, when failure was defined as having subsequent root canal therapy or extraction. Because crowns are a costly dental procedure, people may opt for SDF as a last resort effort to save the tooth instead. Despite the relatively small proportion of such teeth in our study, this finding is consistent with the literature, which suggested that factors including time and the material of the crown are critical factors for tooth survival.[39] Furthermore, a tooth with a crown will require either repair, replacement, endodontic therapy, or extraction because the tooth has already undergone extensive treatment.[40] It has been suggested that 30% of crown replacements are the result of unacceptable crown margins or secondary caries.[41]

Tooth location was a critical factor for both failure types; anterior teeth had significantly higher failure rates than posterior teeth. Although both associations were statistically significant (type 1 failure, $P < .001$; type 2 failure, $P = .009$), the χ^2 value for type 1 failure was larger. One possible explanation for the high rates of anterior teeth is that these teeth already had large lesions, and patients were willing to risk having black stains in a last chance effort to save the tooth.[16]

Despite missing CRA data, multiple variables were collected to categorize caries risk. These challenges are prevalent across other university dental clinics and hospitals. In 1 study,[42] researchers found that although 80% of dental students recognized the importance of documenting both drug dosage and frequency, only one-third of EHRs did so. This highlights a gap between perceived importance and actual practice, suggesting the need for curriculum changes to improve documentation accuracy.[42] In another university study, researchers found that 78.4% of EHRs lacked the dry socket electronic dental record diagnostic code Z1820, despite patients receiving interventions for this condition.[43] Furthermore, 74.3% of these records lacked essential documentation for diagnosing dry sockets, such as severe pain and visible bone in the sockets. This lack of documentation can lead to misdiagnosis and suboptimal treatment, emphasizing the need for better training in proper documentation.[43] Although missing data are a limitation, our findings underscored the need for structured EHR documentation in dental education and practice. Inadequate records on tooth condition before SDF treatment affect our understanding of treatment outcomes, emphasizing the importance of thorough, consistent documentation.

CONCLUSIONS

Our study results underscore the critical role of multiple applications of SDF in enhancing treatment success and longevity, aligning with clinical protocols that advocate its use every 6 months over a 2-year period. Recognizing the benefits of SDF and understanding the potential challenges posed by means of certain patient characteristics can guide clinical practice and inform strategies for optimizing SDF treatment in adults. ■

DISCLOSURE

None of the authors reported any disclosures.

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This study was funded by The James S. and Janice I. Wefel Memorial Research Award from The University of Iowa College of Dentistry, awarded to Dr. A. Al Saffer and The Fuller Denehy Professorship from The University of Iowa College of Dentistry, awarded to Dr. A. Al Saffer.

The authors thank Charles McBrearty and Bill Keating for their help with data collection and Scott Cleven and Carissa Comnick for their contributions in statistical analysis.

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