

Parental Acceptance of Silver Diamine Fluoride (SDF) for Treating Dental Caries in Pediatric Patients: A Comparative Study on Anterior vs. Posterior Teeth and Implications for Anesthesia

**Ali Mahdi Alsalem¹, Dr. Abullah Alqedrah², Dr. Mohamed Albassous³,
Abdullah Ali Alharith⁴, Seham Mahmoud Eldeeb⁵, Ali Mohammed Alyami⁶,
Noura Alqahtani⁷, Fahad Jaber Alsleem⁸**

1. *Dental Hygiene Specialist Najran Cluster Principal Investigator (PI)*
2. *Endodontics Consultant Najran Cluster Co-investigator (Literature Review and Reporting Lead)*
3. *Dentist Najran Cluster Co-investigator (Survey Design and Data Collection Lead)*
4. *Dental Lab Specialist Najran Cluster Co-investigator (Recruitment and Communication Lead)*
5. *M.D., Public Health and Community Medicine, Najran Cluster Co-Investigator (Data Management and Analysis Lead)*
6. *Dental Assistant Specialist Najran Cluster Co-investigator (Survey Design and Data Collection Lead)*
7. *Dentist Najran Cluster Co-investigator*
8. *Senior Dental Lab Specialist Najran Cluster Co-investigator*

Abstract

This study investigates parental acceptance of Silver Diamine Fluoride (SDF) for treating dental caries in children, focusing on preferences related to anterior (front) versus posterior (back) teeth. Given the esthetic implications of SDF, particularly in visible areas, acceptance varies significantly between anterior and posterior teeth. Additionally, the study explores the potential of SDF to reduce the necessity for general anesthesia among uncooperative pediatric patients. Survey responses from a cohort of parents indicate a higher acceptance for posterior teeth applications, with a notable reluctance for anterior teeth. Findings highlight the potential of SDF as an alternative to invasive treatments in posterior teeth, especially for uncooperative children, emphasizing a need for clinician-parent communication regarding esthetic and functional considerations of SDF application.

Introduction

Dental caries are prevalent among pediatric populations, often requiring restorative intervention to prevent further complications. Silver Diamine Fluoride (SDF) has emerged as a minimally invasive treatment option that arrests caries and can delay the need for more invasive interventions (Inchingolo et al., 2024). However, SDF can lead to permanent black staining on the treated areas, which presents esthetic concerns, especially on anterior teeth (Nishino et al., 1969). In cases involving uncooperative children, traditional restorative techniques often necessitate sedation or general anesthesia, which can pose additional risks and costs.

Parental acceptance of SDF varies based on the location of the carious lesion (anterior vs. posterior teeth) and the potential need for anesthesia in uncooperative children (Bagher et al., 2019). This study explores these factors to better understand parental preferences. It highlights the promising role of SDF in potentially reducing the need for sedation in pediatric dentistry, offering a more comfortable and less invasive treatment option for children, and instilling hope about the future of pediatric dentistry.

Methods

Study Design

This study employed a cross-sectional survey to collect data from parents regarding their acceptance of SDF treatment on their children's teeth. The survey included questions on demographic information (age, education, income), the child's behavior during dental procedures, and parental preferences regarding SDF treatment for both anterior and posterior teeth.

Participants

The participants were parents or caregivers of pediatric patients attending dental clinics. All participants provided informed consent to take part in the study. The sample included various socioeconomic and educational backgrounds to assess differences across demographic variables.

Statistical analysis:

Statistical analysis was done using SPSS software version 27 (IBM, 2020). Pearson's Chi-Square and Extended Mantel-Haenszel tests analyzed the association between participants' acceptance of SDF-related color change on the teeth and their socio-demographic and general characteristics. A p -value ≥ 0.05 was considered significant.

IBM Corp. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp; 2020.

Results:

The socio-demographic and general characteristics of the study participants are presented in Table 1. Almost two-thirds of the participants were fathers. Fifty percent of participants were aged 31 to 40 years old, and 43.9% had bachelor's degrees. Nearly half of the participants had ≤ 4 children. Most of the participants had high annual incomes. The attitude towards treating primary teeth was positive in 76.5% of the participants. A history of oral sedation and dental treatment was reported in 62.2% of the participants, while general anesthesia was reported in 13.3%. The child's response to fillings was positive in 64.3% of the participants.

Participants' acceptance of SDF-related color change on the anterior teeth was positive in 17% (figure 1). Regarding the posterior teeth, Participants' acceptance of SDF-related color change was positive in 78% of the participants (figure 2).

There was a statistically significant association between acceptance of SDF-related color change on the anterior teeth and some characteristics of the participants (table 2). Mothers were more open to the SDF-related color change on the anterior teeth than fathers (82.4% versus 22.6%). There was a statistically significant association between parents' age and their acceptance, as the proportions of participants with positive acceptance were high (37.5%) in older age groups (> 50 years old participants). The number of children was associated with positive parents' acceptance, as parents with > 4 children were more open to SDF-related color change on the anterior teeth.

Regarding the posterior teeth, fathers were more open to the SDF-related color change (table 3); otherwise, there was no statistically significant association between acceptance of SDF-related color change on the posterior teeth and other characteristics of the participants.

Table 1: Socio-demographic and general characteristics of the study participants

Variables	No.	%
Study participants:		
Father	124	63.2
Mother	72	36.8
Age (years):		
≤ 20	4	2.0
21 – 30	32	16.3
31 – 40	98	50.0
41 – 50	46	23.5
> 50	16	8.2
Education level:		
Read & Write	4	4.0
Intermediate	14	7.1
High school	54	27.6
Diploma	24	12.2
Bachelor's	86	43.9
Postgraduate	14	7.1
The number of children:		
≤ 4 children	102	52.0
> 4 children	94	48.0
Annual income:		
Middle	184	93.9
High	12	6.1
Participants' attitude towards treating primary teeth:		
Positive	150	76.5
Negative	46	23.5
Child history of restrains during dental treatment:		
- Physical restraint (having to be held down)	48	24.5
- Oral Sedation	122	62.2
- General anesthesia (hospitalization)	26	13.3
Child response to fillings:		
- He couldn't get the fillings	10	5.1
- He cried or screamed, but the fillings were done	24	12.2
- He was upset, but the fillings were done	36	18.4
- He was responsive when getting fillings	126	64.3

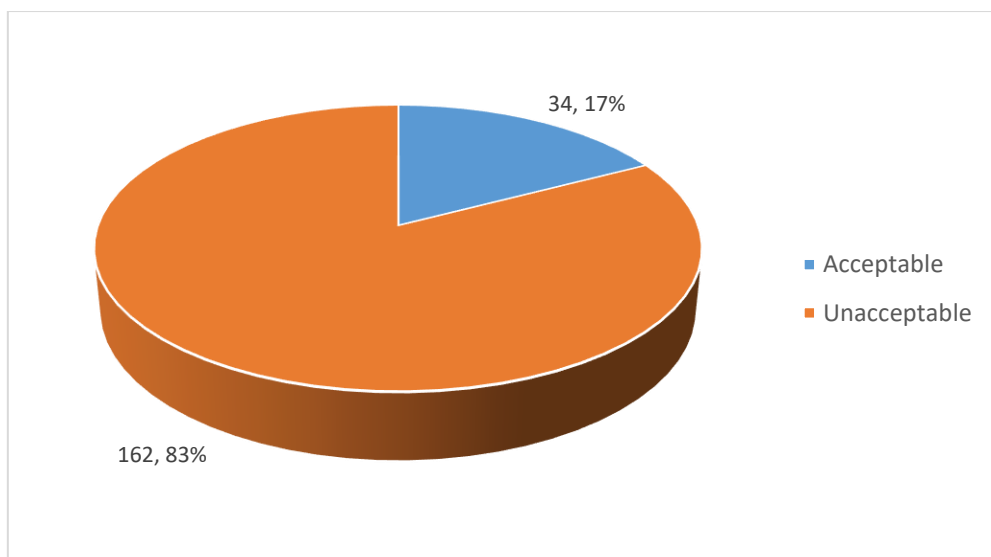


Figure 1. Participants' acceptance of SDF-related colour change on the anterior teeth

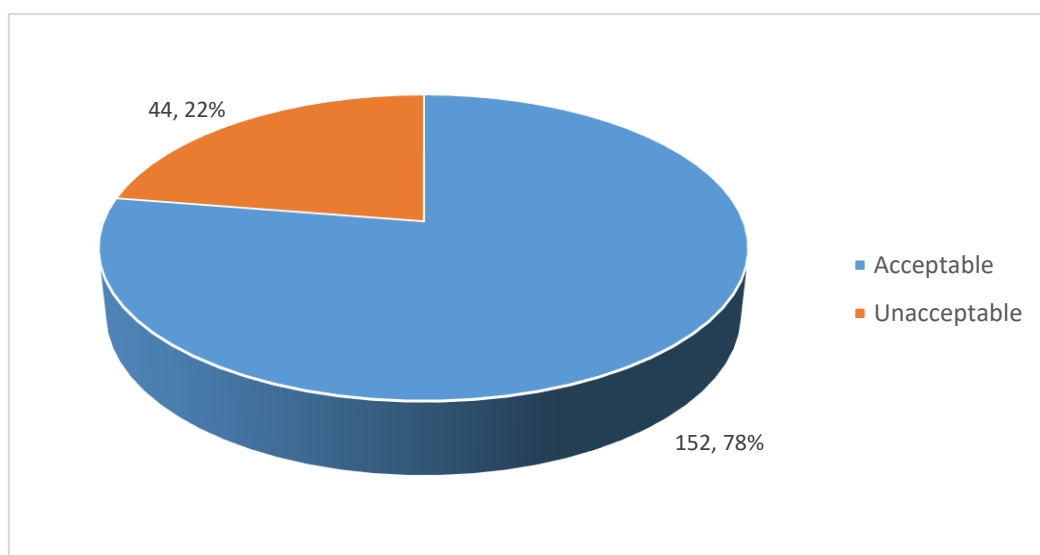


Figure 2. Participants' acceptance of SDF-related colour change on the posterior teeth

Table 2. Association between participants' acceptance of SDF-related colour change on the **anterior** teeth and their socio-demographic and general characteristics:

Variables	Acceptable		Unacceptable		p-value
	No.	%	No.	%	
Study participants:					
Father (n=124)	28	22.6	96	77.4	0.01*
Mother (n=72)	6	82.4	66	59.6	
Age (years):					0.01*
≤ 20 (n=4)	0	0.0	4	100	
21 – 30 (n=32)	2	6.3	30	93.8	
31 – 40 (n=98)	18	18.4	80	81.6	
41 – 50 (n=46)	8	17.4	38	82.6	
> 50 (n=16)	6	37.5	10	62.5	
Education level:					0.9
Read & Write (n=4)	2	50.0	2	50.0	
Intermediate (n=14)	2	14.3	12	85.7	
High school (n=54)	8	14.8	46	85.2	

Diploma (n=24)	2	8.3	22	91.7	
Bachelor's (n=86)	18	20.9	68	79.1	
Postgraduate (n=14)	2	14.3	12	85.7	
The number of children:					
≤ 4 children (n=102)	10	9.8	92	90.2	0.004*
> 4 children (n=94)	24	25.5	70	74.5	
Annual income:					
Middle (n=184)	30	16.3	154	83.7	0.1
High (n=12)	4	33.3	8	66.7	
Participants' attitude towards treating primary teeth:					
Positive (n=150)	24	16.0	126	84.0	0.4
Negative (n=46)	10	21.7	36	78.3	
Child history of restrains during dental treatment:					
- Physical restraint (n=48)	6	12.5	42	87.5	0.6
- Oral Sedation (n=122)	24	19.6	98	80.3	
- General anaesthesia (n=26)	4	15.4	22	84.6	
Child response to fillings:					
- He couldn't get the fillings (n=10)	2	20.0	8	80.0	0.7
- He cried or screamed, but the fillings were done (n=24)	2	8.3	22	91.7	
- He was upset, but the fillings were done (n=36)	8	22.2	28	77.8	
- He was responsive when getting fillings (n=126)	22	17.5	104	82.5	

* Statistically Significant

Table 3. Association between participants' acceptance of SDF-related colour change on the **posterior** teeth and their socio-demographic and general characteristics:

Variables	Acceptable		Unacceptable		p-value
	No.	%	No.	%	
Study participants:					
Father (n=124)	104	83.9	20	16.1	0.01*
Mother (n=72)	48	66.7	24	33.3	
Age (years):					
≤ 20 (n=4)	4	100	0	0.0	0.4
21 – 30 (n=32)	26	81.3	6	18.8	
31 – 40 (n=98)	70	71.4	28	28.6	
41 – 50 (n=46)	36	78.3	10	21.7	
> 50 (n=16)	16	100	0	0.0	
Education level:					
Read & Write (n=4)	2	50.0	2	50.0	0.7
Intermediate (n=14)	10	71.4	4	28.6	
High school (n=54)	42	77.8	12	22.2	
Diploma (n=24)	22	91.7	2	8.3	
Bachelor's (n=86)	66	76.7	20	23.3	
Postgraduate (n=14)	10	71.4	4	28.6	
The number of children:					
≤ 4 children (n=102)	80	78.4	22	21.6	0.8
> 4 children (n=94)	72	76.6	22	23.4	

Annual income:					
Middle (n=184)	142	77.2	42	22.8	0.6
High (n=12)	10	83.3	2	16.7	
Participants' attitude towards treating primary teeth:					
Positive (n=150)	116	77.3	34	22.7	0.9
Negative (n=46)	36	78.3	10	21.7	
Child history of restrains during dental treatment:					
- Physical restraint (n=48)	32	66.7	16	33.3	0.2
- Oral Sedation (n=122)	100	82.0	22	18.0	
- General anesthesia (n=26)	20	76.9	6	23.1	
Child response to fillings:					
- He couldn't get the fillings (n=10)	10	100	0	0.0	0.8
- He cried or screamed, but the fillings were done (n=24)	18	75.0	6	25.0	
- He was upset, but the fillings were done (n=36)	24	66.7	12	33.3	
- He was responsive when getting fillings (n=126)	100	79.4	26	20.6	

* Statistically Significant

Discussion

The findings suggest that while parents generally accept SDF treatment on posterior teeth, there remains a strong reluctance for anterior teeth applications due to the visible black staining effect. This esthetic concern aligns with previous studies on parental preferences in pediatric dentistry, which have shown that appearance plays a critical role in treatment choice, particularly for visible areas like the anterior teeth (Crystal et al., 2017), (Alshammari et al., 2019), (Clemens et al., 2018).

The significant preference for SDF in posterior teeth among uncooperative children suggests that SDF can serve as an alternative to sedation and general anesthesia, offering a less invasive approach with fewer health risks and lower costs (Crystal et al., 2017). These findings underscore the crucial role of clinicians in communicating SDF's benefits and esthetic limitations, especially in cases where anesthesia might otherwise be necessary. This empowers clinicians to ensure informed decision-making and patient satisfaction.

Impact on Waiting Lists and Clinic Efficiency

The long waiting lists in pediatric dental clinics are often the result of children needing complex, time-consuming treatments under general anesthesia. These procedures require both a dental team and anesthesiologists, operating rooms, and recovery time, making the scheduling process lengthy and resource-intensive. By contrast, SDF can be applied quickly in a routine dental visit, freeing up valuable clinic time and resources.

If parental acceptance of SDF increases, it could reduce the number of children waiting for invasive procedures. Approximately 60% of parents accept general anesthesia for their children's dental treatment. If even a fraction of these parents were to choose SDF instead, it could significantly reduce the pressure on clinics. For example, if 30% of parents who currently opt for general anesthesia were to choose SDF, this could lead to a substantial reduction in waiting times, as SDF requires less clinical time and no special facilities.

Psychological and Physical Benefits for Children

One of the key benefits of increasing the use of SDF is the reduction in psychological trauma for children. Invasive dental procedures, particularly those requiring general anesthesia, can be distressing for young patients. Studies have shown that general anesthesia can have long-term psychological effects, with many children developing dental phobia or anxiety related to dental visits. In this study, 60% of parents expressed concerns about their child's anxiety during dental procedures.

By using SDF, children can avoid the fear and discomfort associated with invasive treatments. This improves their immediate dental experience and reduces the likelihood of them developing a fear of dentists, which can impact their long-term dental health. Avoiding the use of general anesthesia also reduces the risk of adverse side effects. According to the survey, 75% of parents were concerned about the safety of general anesthesia, especially given its potential neurodevelopmental risks in young children. Therefore, promoting SDF as an alternative could alleviate these concerns and improve pediatric patients' psychological outcomes.

Focus on Primary Teeth and Time-Limited Concerns

A common concern among parents is the cosmetic effect of SDF, as the treated teeth develop a black stain. This concern is particularly prominent for anterior teeth, with 72.45% of parents rejecting using SDF on their child's front teeth. However, it is essential to emphasize that SDF is often used on primary teeth, which will naturally fall out and replace permanent teeth.

By educating parents about the temporary nature of this cosmetic issue, dental professionals can help shift the focus toward the long-term health benefits of arresting caries. Given that SDF prevents the need for more invasive treatments, which could have a lasting psychological impact, its use is a valuable intervention for managing dental decay in primary teeth.

Preventive Education for Parents

One advantage of using SDF is the opportunity it provides for dental professionals to educate parents about preventive care. The time saved by avoiding complex treatments under general anesthesia can be used to promote good oral hygiene practices, such as regular tooth brushing, flossing, and routine dental checkups. In this study, 55% of parents expressed concerns about the financial costs of dental treatments. By preventing further decay through education, parents can reduce the need for costly interventions in the future.

Educational campaigns should focus on teaching parents about the importance of early intervention and preventive care to ensure the long-term dental health of their children. Encouraging parents to bring their children in for regular checkups and educating them on proper oral hygiene practices can help reduce the incidence of caries, ultimately decreasing the need for both SDF and invasive procedures.

Acceptance and Reduction in General Anesthesia

The results highlight the potential of SDF to reduce the number of children requiring general anesthesia, particularly for posterior teeth, where acceptance rates are higher. By adopting SDF, dental practitioners can offer a safer, non-invasive treatment that aligns with parental preferences for avoiding GA, particularly posterior teeth.

Limitations

This study is limited by its relatively small sample size and the focus on a single center in Najran. Further research with a larger sample is necessary to validate these findings.

Conclusion

Conclusion Implications of the Findings This study confirms that SDF is more acceptable for posterior teeth than anterior teeth among parents, primarily due to aesthetic concerns. However, its acceptance for posterior applications, particularly in cases with uncooperative children, suggests that SDF could significantly reduce the need for general anesthesia in pediatric dentistry. This reassures the audience about the safety of pediatric dental treatments, offering a safer and more comfortable treatment option. Clinicians should consider incorporating SDF as part of a comprehensive treatment plan, emphasizing its benefits in managing caries with minimal intervention.

References

- Horst, J. A., Ellenikiotis, H., & Milgrom, P. L. (2016). UCSF protocol for caries arrest using silver diamine fluoride: rationale, indications, and consent. *Journal of the California Dental Association*, 44(1), 17-28.
- Crystal, Y. O., & Niederman, R. (2019). Evidence-based dentistry update on silver diamine fluoride. *Dental Clinics*, 63(1), 45-68.
- Ruff, R. R., Whittemore, R., Grochecki, M., Bateson, J., & Barry-Godin, T. (2021). Silver diamine fluoride and oral health-related quality of life: A network meta-analysis. *medRxiv*, 2021-04.
- Inchingolo, F., Inchingolo, A. D., Latini, G., Sardano, R., Riccaldo, L., Mancini, A., ... & Dipalma, G. (2024). Caries in Primary Molars: Is Silver Diamine Fluoride Effective in Prevention and Treatment? A Systematic Review. *Applied Sciences*, 14(5), 2055.
- Bagher, S. M., Sabbagh, H. J., AlJohani, 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*, pp. 829–835.
- Nishino, M., Yoshida, S., Sobue, S., Kato, J., & Nishida, M. (1969). Effect of topically applied ammoniacal silver fluoride on dental caries in children. *The Journal of Osaka University Dental School*, pp. 9, 149–155.
- Crystal, Y. O., Janal, M. N., Hamilton, D. S., & Niederman, R. (2017). Parental perceptions and acceptance of silver diamine fluoride staining. *The Journal of the American Dental Association*, 148(7), 510-518.
- Alshammari, A. F., Almuqrin, A. A., Aldakhil, A. M., Alshammari, B. H., & Lopez, J. N. J. (2019). Parental perceptions and acceptance of silver diamine fluoride treatment in Kingdom of Saudi Arabia. *International journal of health sciences*, 13(2), 25.
- Clemens, J., Gold, J., & Chaffin, J. (2018). Effect and acceptance of silver diamine fluoride treatment on dental caries in primary teeth. *Journal of public health dentistry*, 78(1), 63-68.