Annals Journal of Dental and Medical Assisting
2021, Volume 1, Page No: 9-15

Available online at: www.tsdp.net

TSDP
Turkish Specialized Dental Publication

Original Article

Exploring Pediatric Dentists' Knowledge and Practices Related to Silver Di Amine Fluoride

Galvin Sim Siang Lin[1]*, Sze Hui Koh[2], Karyn Zuhuan Ter[3], Chia Wei Lim[4], Sharmin Sultana[5], Wen Wu Tan[6]

[1]Department of Dental Materials, Faculty of Dentistry, Asian Institute of Medicine, Science and Technology (AIMST) University, Bedong 08100, Kedah, Malaysia.
[2]Puchong Dental Clinic, Ministry of Health Malaysia, Puchong 47100, Selangor, Malaysia.
[3]KK2 Batu Pahat Clinic, Ministry of Health Malaysia, Batu Pahat 83000, Johor, Malaysia.
[4]Taman Intan Clinic, Ministry of Health Malaysia, Sungai Petani 08000, Kedah, Malaysia.
[5]Department of Orthodontics, Faculty of Dentistry, Manipal University College Malaysia. (MUCM), Bukit Baru 75150, Melaka, Malaysia.
[6]Department of Dental Public Health, Faculty of Dentistry, Asian Institute of Medicine, Science and Technology (AIMST) University, Bedong 08100, Kedah, Malaysia.

***E-mail** ✉ galvin@iium.edu.my

Received: 29 May 2024; **Revised:** 29 August 2024; **Accepted:** 02 September 2021

ABSTRACT

For the treatment of dental hypersensitivity, silver diamine fluoride (SDF) is used topically (label indication). The security of using SDF for treating cavitated lesions has been extensively studied. As far as we are aware, dentists' use of SDF is not commensurate with the overwhelming data supporting its application. A few of the variables that could influence the use of SDF in clinical practice are the dentist's educational background, commercial accessibility, and the nature of the clinical practice. Assessing Saudi Arabian pediatric dentists' knowledge, attitudes, and practices about SDF was the research's main goal. Cross-sectional and experimental. To conduct a survey, a pretested questionnaire with multiple-choice inquiries on a 5-point Likert scale was utilized. The most common reasons to employ SDF were children with medically impaired conditions, followed by children with behavioral problems and anxiety, with 55% of the participants having utilized or employed SDF. Similarly, the highest scores were given to cavitated lesions (65%) in the primary teeth's non-aesthetic area (62%). The use of SDF and knowledge of how to utilize SDF were shown to be significantly positively correlated. The majority of those surveyed supported adding SDF to the undergraduate curriculum. The usage of SDF showed a positive correlation with awareness, which may indicate that instructing pediatric dentists at different stages might raise SDF use.

Keywords: Knowledge, Attitude, Silver di amine fluoride, Practices, Jeddah

How to Cite This Article: Lin GSS, Koh SH, Ter KZ, Lim CW, Sultana S, Tan WW. Exploring Pediatric Dentists' Knowledge and Practices Related to Silver Di Amine Fluoride. Ann J Dent Med Assist. 2021;1:9-15.

Introduction

The Kingdom of Saudi Arabia has a decayed missing filled teeth (DMFT) grade of 5.0 and a national occurrence of 80%, indicating that dental caries in children is still quite severe [1–5]. Because early childhood caries is a complex issue with many facets, such as treatment accessibility, cost, or behavioral problems, management of this condition remains a mystery [6]. In these situations, silver diamine fluoride (SDF) has been proposed as an inexpensive substitute for caries treatment. Although research on SDF's ability to stop dental caries has been done in several nations [7, 8], the US Food and Drug Administration just approved its commercial usage in 2014 [9].

Tooth hypersensitivity is treated topically with SDF (label indication). However, studies on the effectiveness of SDF in adults demonstrate that treatment helps prevent and arrest root caries and remineralize deep occlusal lesions.

The security of using SDF to treat cavitated lesions has been extensively studied. It has been asserted that SDF offers patients who are unable to get conventional treatments an option, especially youngsters for whom general anesthesia may be required for dental care. SDF seems to successfully prevent dental cavities in the complete primary dentition when compared to no therapy, a placebo, or fluoride varnish [10]. According to a study, stronger caries reduction or a greater ability to arrest caries has been seen at 30% and 38% SDF concentrations [11].

By implementing SDF to the lesion without extracting any diseased soft dentin, caries can be clinically stopped [12]. Uncertainty surrounds the method via which SDF causes caries arrest. Its antimicrobial properties, remineralization potential, and prevention of organic matrix degradation may all contribute to its putative mechanism of action [11]. It has been noted that lesion propagation has slowed down [13] and that lesion depth has decreased [14]. When SDF is applied, *Streptococcus mutans* and *Lactobacillus acidophilus* levels are considerably decreased [15], and an insoluble precipitate of Ag_3PO_4 is formed [16].

Although there is a wealth of data to support the usage of SDF, dentists do not, as far as we know, utilize it in proportion. Some of the elements that may influence the adoption of SDF in clinical practice include the dentist's educational background, commercial availability, and the kind of clinical practice. This study aimed to evaluate the knowledge, attitude, and practice of Saudi Arabian pediatric dentists regarding SDF.

Materials and Methods

The adopted study design was descriptive cross-sectional. Ethical approval was exempted from the survey by the ethical committee. The survey was conducted amongst pediatric dentists in academic positions, clinical practitioners, or both. A convenience sample, targeting at least 10% of the assumed upper limit of the population of 400 pediatric dentists, was calculated to be 40, and the survey was distributed to 100 practitioners and Faculties. The questions were designed to collect data on the knowledge and practices of Pediatric dentists concerning SDF. Multiple choice questions and questions with a 5-point Likert scale were used to collect data in the form of a pretested questionnaire. The link for the survey was created on Google Forms and distributed through emails and social media. Four weeks after the initial round, reminders were sent and the data collection was completed after 2 months. Response to the survey was considered as implicit consent. The data was tabulated and Statistical analysis was performed using IBM SPSS version 23. Pearson's correlation was used to evaluate the relationships between the indices. $P < 0.05$ was considered to be statistically significant.

Results and Discussion

Microsoft Excel was used to tabulate the responses, and the mean and standard deviation were displayed. Overall, the inter-item consistency coefficient for Cronbach's alpha was 0.82. Women made up 72.4% of the 58 full replies that were received, while men made up 27.6%. The number of respondents and percentages represent the demographic information and the proportion of pediatric dentists who are or have utilized employing SDF **(Table 1)**. On a 5-point scale from "great deal" to "nothing at all," **Table 2** displays the perceived knowledge of usage, benefits over traditional therapy, and potential issues. Between 55% and 68% of respondents said "quite a bit" and "a great deal."

Knowledge of general signs of SDF is represented in **Table 3** using a 5-point Likert scale (strongly agree to strongly disagree). Children with medical conditions had the highest ratings (strongly agree and agree combined) at 74%, followed by behavioral problems and anxiety at 73%. Knowledge of certain indications and SDF practice is included in **Table 4**. Lesions in the non-aesthetic area of primary teeth that were cavitated (65%) received the highest marks (strongly agree and agree combined) at 62%. **Table 5** lists the reasons why pediatric dentists may or may not employ SDF. The greatest ratings (49%), however, were attributed to the barrier to utilization caused by the lack of commercial availability of SDF. Five indexes using factor analysis prepared by fusing inquiries and the query: In your clinical practice, have you utilized or are you using SDF now? The utilization of SDF (A) and knowledge about its use, as well as the perception of knowledge and utilization in the primary/permanent, aesthetic/non-aesthetic area, were significantly positively correlated **(Table 6)**.

Table 1. Gender, age, education, and whether pediatric dentists utilized SDF in clinical practice are among the demographic details.

Demographic Data		Number	Percentage
Gender	**Female**	42	72.4
	Male	16	27.6

Age (Years)	**25-29**	21	36.2
	30-35	17	29.3
	36-40	4	6.9
	41-45	11	19
	46-50	3	5.2
	Above 51	2	3.4
Qualification	**Board**	34	56.9
	Masters	16	27.6
	PhD	9	15.5
Have you used/currently used SDF in your clinical practice?	**Yes**	33	56.9
	No	25	43.1

Table 2. Five-point rating system for perceived usage knowledge, benefits above traditional treatments, and possible issues

		A Great Deal 1	**Quite a bit 2**	**Some what 3**	**Very little 4**	**Nothing at all 5**	**Mean**	**STD error**
How much do you know regarding:	What SDF is used for in dentistry	22% (13)	38% (22)	22% (13)	10% (6)	7% (4)	2.414	.1517
	How SDF is used to treat dental caries in pediatric patients	33% (19)	38% (22)	17% (10)	5% (3)	7% (4)	2.155	.1512
	The advantages SDF treatment can have over traditional treatment	33% (19)	35% (20)	17% (10)	5% (3)	10% (6)	2.259	.1660
	Potential problems SDF usage can have	24% (14)	31% (18)	31% (18)	7% (4)	7% (4)	2.414	.1497

Note: Percentages may not be 100% in all cases due to rounding.

Table 3. Knowledge of general indications of SDF on a 5-point scale

		Strongly agree 1	**Agree 2**	**Neutral 3**	**Disagree 4**	**Strongly disagree 5**	**Mean**	**STD error**
SDF treatment is a good treatment alternative	For restorations in children with behavioral difficulties and dental anxiety	40% (23)	33% (19)	19% (11)	5% (3)	3% (2)	2.000	.1391
	For a medically compromised child	43% (25)	31% (18)	14% (8)	3% (2)	9% (5)	2.034	.1612
	When a parent cannot pay for his/her child's treatment	31% (18)	21% (12)	36% (21)	7% (4)	5% (3)	2.345	.1507
	When dental procedures require patients to be treated under general anesthesia	28% (16)	26% (15)	26% (15)	15% (9)	5% (3)	2.448	.1578

Table 4. Knowledge of specific indications and practice of SDF

	Strongly agree (1)	**Agree (2)**	**Neutral (3)**	**Disagree (4)**	**Strongly disagree (5)**	**MEAN**	**STD ERROR**
SDF can be used to arrest the non-cavitated lesion	22% (13)	29% (17)	24% (14)	14% (8)	10% (6)	2.603	.1667
SDF can be used to arrest the cavitated lesion	29% (17)	36% (21)	21% (12)	10% (6)	3% (2)	2.224	.1435

It is not necessary to put a restoration after SDF is used to arrest cavitated lesions	14% (8)	35% (20)	24% (14)	19% (11)	9% (5)	2.741	.1547
SDF should be used before all restorations in all patients (routinely)	7% (4)	19% (11)	26% (15)	33% (19)	16% (9)	3.310	.1520
SDF should be used before placing all restorations in high caries-risk patients	17% (10)	21% (12)	35% (20)	19% (11)	9% (5)	2.810	.1564
SDF is a good treatment to be used to treat lesions that: Are not in the aesthetic zone in primary teeth?	17% (10)	45% (26)	24% (14)	12% (7)	2% (1)	2.362	.1271
SDF is a good treatment to be used to treat lesions that: Are in the aesthetic zone in primary teeth?	5% (3)	38% (22)	28% (16)	21% (12)	9% (5)	2.463	.134
SDF is a good treatment to be used to treat lesions that: Are not in the aesthetic zone in the permanent teeth?	10% (6)	36% (21)	40% (23)	10% (6)	4% (2)	2.603	.1228
SDF is a good treatment to be used to treat lesions that: Are in the aesthetic zone in the permanent teeth?	12% (7)	24% (14)	21% (12)	24% (14)	19% (11)	3.138	.1730

Table 5. The barrier to usage of SDF expressed as a percentage with mean and standard error

	Strongly agree (1)	**Agree (2)**	**Neutral (3)**	**Disagree (4)**	**Strongly disagree (5)**	**MEAN**	**STD ERROR**
I am not using/ may not use SDF because: I don't have enough knowledge	12% (7)	19% (11)	31% (18)	26% (15)	12% (7)	3.069	.1572
I am not using/ may not use SDF because: I'm not very skilled at using it.	10% (6)	17% (10)	35% (20)	24% (14)	14% (8)	3.138	.1545
I am not using/ may not use SDF because: My aesthetic is poor.	14% (8)	14% (8)	33% (19)	27% (16)	12% (7)	3.025	.1477
I am not using/ may not use SDF because: Patient satisfaction is less.	7% (4)	28% (16)	33% (19)	29% (17)	3% (2)	2.948	.1311
I am not using/ may not use SDF because: SDF does not have enough evidence for use.	9% (5)	10% (6)	33% (19)	33% (19)	16% (9)	3.362	.1490
I am not using/ may not use SDF because: SDF does not allow a restoration to be placed and hence anatomy cannot be restored.	5% (3)	21% (12)	31% (18)	29% (17)	14% (8)	3.259	.1446
I am not using/ may not use SDF because: the level of evidence behind SDF safety and efficacy is not sufficient.	5% (3)	17% (10)	40% (23)	29% (17)	9% (5)	3.190	.1312
I am not using/ may not use SDF because: Insurance does not cover SDF.	9% (5)	16% (9)	22% (13)	41% (24)	12% (7)	3.328	.1504
I am not using/ may not use SDF because: SDF is not readily available commercially	7% (4)	42% (25)	28% (16)	14% (8)	9% (5)	2.741	.1403

Table 6. The five indicators' correlations were created by combining the following questions: Do you now employ or have you utilized SDF in your clinical practice?

Indices created by clubbing questions	A	B	C	D	E	F
A: Have you used/currently use SDF in your clinical practice?	1.000	.210	.025	-.056	-.162	-.117
B: Perceived knowledge	.210	1.000	.581*	.152	.050	-.128
C: Knowledge of general indications to use SDF	.025	.581*	1.000	.344*	.116	-.034
D: Practice of SDF	-.056	.152	.344*	1.000	.422*	.321*
E: Use in Primary/Permanent, Aesthetic/Non-aesthetic Zone	-.162	.050	.116	.422*	1.000	.191
F: Barriers to usage	-.117	-.128	-.034	.321*	.191	1.000

This survey is the first of its sort in Saudi Arabia, as far as we are aware. Therefore, the outcomes from the current investigation will serve as a baseline for future research on the state of SDF in the nation, notwithstanding the inherent constraints of the convenience sample approach used in the current survey. Additionally, the survey was sent to several hospitals and educational institutions nationwide, even if it was not completely random, guaranteeing that a wider sample of the nation's pediatric dentists could be surveyed.

Over 55% of the participants admit to using or presently utilizing SDF. Compared to dentists in general, the proportion is much greater [17]. Approximately 25% of dentists were using SDF at the time of the research, according to a prior investigation, and it is anticipated that more dentists will utilize it in the future [18]. Given that a sizable portion of pediatric dentists surveyed had never utilized SDF, the present state of SDF utilization in Saudi Arabia can be compared to that of other countries.

More than 60% of respondents said they knew a lot about the use of SDF in dentistry. (in which quite a little and a great lot were united). Despite being done in a general dental population, the replies to the question about its use in pediatric patients were greater (70%) and equivalent to the values mentioned in the literature (77%) [18]. The discrepancy between the proportion of pediatric dentists who use SDF and those who feel they know about it suggests that certain obstacles may be keeping them from implementing SDF in their practice/teaching.

According to the most widely surveyed comments, pediatric dentists preferred using SDF in children with behavioral and anxiety disorders as well as in children who were medically challenged. The results align with earlier research [15, 17]. Most people see management under general anesthesia as a last resort, and they would prefer any other option. Furthermore, SDF therapy was viewed as more acceptable by parents than the more sophisticated behavior control techniques [19]. In contrast to responses from other research, the majority of respondents regarded the inability to pay for the therapy as neutral [18]. A variety of academics and professionals from both government and private hospitals and institutes participated in our study. The neutral position is likely explained by the fact that government hospitals and private and public educational institutions may provide treatment at no cost or heavily discounted prices. However, private practitioners could view cost as a significant consideration when selecting SDF.

Many pediatric dentists were unsure about the issue, and the comments about the routine or high-risk patients' usage of SDF before restoration produced conflicting findings. The efficacy of SDF in stopping carious lesions has been documented in the majority of the literature.

Nonetheless, there is, at most, no data supporting SDF's "preventive-centered caries management" effect for treating non-cavitated lesions or preventing the development of new ones [20].

Permanent teeth in the aesthetic zone had the least reaction among the indications, whereas primary teeth in the non-aesthetic zone received the most. Studies have indicated that the preventative potential of SDF is significantly greater in primary teeth, in addition to the fact that all of the responders were pediatric dentists [21]. Additionally, the dentition is exclusively primary in the age range of 3-5, when behavioral problems may preclude restorative operations under local anesthetic. However, research also shows that caries in the front teeth are far more likely to be stopped than those in the posterior primary teeth and on any other surface of the permanent dentition [22].

Pediatric dentists felt that undergraduate dentistry education ought to include instruction in the use of SDF. According to a prior study, greater professional education increases knowledge, fosters favorable attitudes, and increases the likelihood of using SDF

[18]. Additionally, SDF may offer regular dentists who lack expertise in sophisticated behavior management approaches a great chance to treat cavities in recalcitrant youngsters.

Conclusion

Knowledge and SDF usage were positively correlated, which likely suggests that training pediatric dentists at different stages might boost SDF use. On the use of SDF in cavitated lesions, the pediatric dentists who responded to the study agreed, although they were unclear about its function in caries prevention. According to a few of the responders, SDF should be included in college curricula to provide recent graduates with an option for managing dental cavities.

Acknowledgments: We are thankful to all the pediatric dentists who were willing to participate in this research.

Conflict of Interest: None

Financial Support: None

Ethics Statement: The Ethical Committee of Ibn Sina National College for Medical Studies, Jeddah, Kingdom of Saudi Arabia (Reference: H-10-22122019) approved this study.

References

1. Al Agili DE. A systematic review of population-based dental caries studies among children in Saudi Arabia. Saudi Dent J. 2013;25(1):3-11.
2. Jahanimoghadam F, Gisour EF, Askari R, Rad M. Attitude regarding dental stem cells among dental practitioners in Kerman, Iran. Arch Pharma Pract. 2018;9(3):10-3.
3. Alanazi MH, Barnawi NI, Almohaimel SA, Almutairi MA, Alanezi OK, Qureshi LW, et al. Evaluation of dental pulp testing: simple literature review. Arch Pharma Pract. 2019;10(3):37-40.
4. Bulgakova AI, Vasilyeva NA, Vasilyev EA. The clinical and immunological rationale for the use of prolonged action dental ointment in periodontology. J Adv Pharm Educ Res. 2019;9(4):65-9.
5. Kharalampos M, Put VA, Tarasenko SV, Reshetov IV. Comprehensive patient rehabilitation while performing immediate dental implant placement with the use of information-wave therapy (literature overview). J Adv Pharm Educ Res. 2020;10(2):1-6.
6. Burgette JM, Quiñonez RB. Cost-effectiveness of treating severe childhood caries under general anesthesia versus conscious sedation. JDR Clin Trans Res. 2018;3(4):336-45.
7. Gotjamanos T. Safety issues related to the use of silver fluoride in paediatric dentistry. Aust Dent J. 1997;42(3):166-8.
8. 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;81(11):767-70.
9. Association of state and territorial dental directors (ASTDD) silver diamine fluoride (SDF) fact sheet. Available from: https://www.astdd.org/www/docs/sdf-fact-sheet-09-07-2017.pdf
10. Oliveira BH, Rajendra A, Veitz-Keenan A, Niederman R. The effect of silver diamine fluoride in preventing caries in the primary dentition: a systematic review and meta-analysis. Caries Res. 2019;53(1):24-32.
11. Zhao IS, Gao SS, Hiraishi N, Burrow MF, Duangthip D, Mei ML, et al. Mechanisms of silver diamine fluoride on arresting caries: a literature review. Int Dent J. 2018;68(2):67-76.
12. American Academy of Pediatric Dentistry. Chairside guide: silver diamine fluoride in the management of dental caries lesions. Pediatr Dent. 2017;39(6):478-9.
13. Klein U, Kanellis M, Drake D. Effects of four anticaries agents on lesion depth progression in an in vitro caries model. Pediatr Dent. 1999;21(3):176-80.
14. Mei ML, Ito L, Cao Y, Li QL, Lo EC, Chu CH. Inhibitory effect of silver diamine fluoride on dentine demineralisation and collagen degradation. J Dent. 2013;41(9):809-17.
15. Knight GM, McIntyre JM, Craig GG, Zilm PS, Gully NJ. An in vitro model to measure the effect of a silver fluoride and potassium iodide treatment on the permeability of demineralized dentine to streptococcus mutans. Aust Dent J. 2005;50(4):242-5.
16. Nelson T, Scott JM, Crystal YO, Berg JH, Milgrom P. Silver diamine fluoride in pediatric dentistry training programs: survey of graduate program directors. Pediatr Dent. 2016;38(3):212-7.
17. Vollú AL, Moreira JP, Luiz RR, Barja-Fidalgo F, Fonseca-Gonçalves A. Survey of knowledge, attitudes and practices of brazilian dentists regarding silver diamine fluoride. Pesqui Bras Odontopediatria Clín Integr. 2020;20(7):e4280.

18. 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;83(2):173-82.
19. Crystal YO, Janal MN, Hamilton DS, Niederman R. Parental perceptions and acceptance of silver diamine fluoride staining. J Am Dent Assoc. 2017;148(7):510-8.
20. Gao SS, Chen KJ, Duangthip D, Wong MC, Lo EC, Chu CH. Preventing early childhood caries with silver diamine fluoride: study protocol for a randomised clinical trial. Trials. 2020;21(1):1-7.
21. Contreras V, Toro MJ, Elías-Boneta AR, Encarnación-Burgos MA. Effectiveness of silver diamine fluoride in caries prevention and arrest: a systematic literature review. Gen Dent. 2017;65(3):22.
22. Llodra JC, Rodriguez A, Ferrer B, Menardia V, Ramos T, Morato M. Efficacy of silver diamine fluoride for caries reduction in primary teeth and first permanent molars of schoolchildren: 36-month clinical trial. J Dent Res. 2005;84(8):721-4.