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Effect of silver diamine fluoride versus sodium fluoride varnish in treatment of carious primary teeth: A randomized clinical trial

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A R T I C L E I N F O.

Keywords:
Silver Diamine Fluoride; Caries arrest; New caries.

Abstract

Background: Early childhood caries (ECC) is a great global problem that affects millions of children in the preschool stage, identifying effective, low-cost treatment caries methods is highly important to improve young children's oral health. Silver diamine fluoride (SDF) application is considered a successful noninvasive approach to arrest dental decay in young children. Therefore, the aim of this study was to evaluate the effect of SDF on postoperative pain, caries arrest (tactile sensation & visual examination) and new caries formation and compare it with a sodium fluoride varnish in the treatment of carious primary teeth.

Methods: Sixty-Two Children with 298 carious primary teeth were randomly allocated into: Group I: (38%) Silver Diamine Fluoride and Group II: (5%) Sodium Fluoride Varnish (control group). Postoperative pain, tactile sensation, and visual examination of caries arrest and new caries were reported after 3,6,9 and 12 months.

Results: Postoperative pain and new caries among children increased in group II than in group I after six and 12 months. While caries arrest increased in group I than in group II with a statistically significant difference in all follow-up periods.

Conclusion: The application of SDF is a conservative option in caries management among populations where surgical management of decay is not possible. A 5 % NaF is effective but less than SDF varnish.

1 Introduction

Despite the strides made through interventions like water fluoridation and the use of fluoridated toothpaste, dental caries remains a significant global concern affecting people of all ages, with preschool children being especially at risk. Untreated dental caries can lead to serious consequences such as infections, pain, and the need for expensive treatments, including procedures requiring general anesthesia for severe cases of decay [1]. Thus, it underscores the ongoing need for promoting oral hygiene, improving access to preventive dental care, and implementing public health measures like water fluoridation to combat this persistent problem [2,3].

The efficacy of fluoride varnish in preventing caries, its ease of application, and its safety provide it with distinct advantages over alternative forms of topical fluoride treatments like gels and rinses, as well as other methods of managing dental caries [4]. Fluoride varnish extends the duration of contact between fluoride and the tooth surface, thereby reducing the risk of caries. Its straightforward application process makes it highly adaptable and

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convenient for use in various settings, including clinics, health camps, and with diverse age groups [5].

Consequently, fluoride varnish is considered one of the premier topical fluoride agents for preventing and managing caries in young children [4]. According to findings from the Cochrane database, fluoride varnish has been shown to effectively decrease tooth deca in both primary and permanent dentitions [6]. Furthermore, Milgrom et al., 2014 [7] stated that Fluoride varnish (5% NaF) effectively prevents dental caries (tooth decay) and is the standard of care [7].

Numerous studies have investigated the efficacy of Silver Diamine Fluoride (SDF), a transparent liquid, in halting decay progression. Its effectiveness is attributed to harnessing the potent antibacterial properties of silver in conjunction with the demineralizing effects of fluoride, resulting in a formidable combination. Consequently, SDF is acknowledged as a successful therapeutic agent frequently employed to treat carious lesions in young children. Furthermore, the American Academy of Pediatric Dentistry highlighted in 2017 [14] that SDF's success rate is comparable to that of restorations conducted under general anesthesia, owing to its capacity to halt bacterial activity [8,9].

Because of its antibacterial and remineralizing properties, silver diamine fluoride is recommended for use in deciduous teeth, particularly in certain conditions such as early childhood caries (ECC), children with special needs, behavioral or medical conditions that may hinder traditional therapy, salivary disorders, and for children who may face challenges in accessing frequent medical and dental care or affording such care [10,11].

The Evidence-Based Dentistry Center of the American Dental Association has highlighted the limited evidence concerning the use of Silver Diamine Fluoride (SDF) among children, despite the promising outcomes associated with SDF. Additionally, they have emphasized the necessity for further clinical research to enhance understanding of patient safety and preferences. Consequently, a study was conducted to evaluate the impact of silver diamine fluoride compared to sodium fluoride varnish on postoperative pain, caries arrest, and the development of new caries in the treatment of carious primary teeth [12].

2 Materials and Methods

2.1 Ethical Approval:

Randomized Clinical Trial RCT (NCT03554980) was conducted in the Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University, Egypt. The written informed consent assigned by parents included detailed information about the research topic, such as possible benefits and harms, treatment procedures, researcher contact information, and intervals of follow-up visits. This research was approved by the Research Ethics Committee, Faculty of Dentistry– Cairo University with approval number (18.7.54).

2.2 Sample size calculation and distribution:

The total sample size of 62 patients (31 per group) was calculated using a Power calculator for a binary outcome superiority trial. [Online] Available from: https://www.sealedenvelope.com/power/binary superiority. Using the computerized lottery system, with the parallel group and allocation ratio (1:1), an equivalence framework was performed, Group I (Intervention group 31 patients / 175 teeth): application of 38% Silver Diamine Fluoride SDF according to the American Academy of Pediatric Dentistry's AAPD, 2018

Group II (control group 31 patients / 123 teeth) application of 5% Sodium Fluoride Varnish NaF according to Macpherson et al., 2010 [13].

2.3 Samples selection:

Inclusion Criteria:

Children with carious primary teeth before the eruption of permanent teeth.

High caries risk patients with anterior or posterior carious lesions.

Uncooperative children without access to or with difficulty accessing dental care.

Exclusion Criteria:

Children with spontaneous or elicited pain from caries.

Tooth mobility.

Signs of pulpal infection.

Severe medical conditions that would not allow management in the clinic.

Hereditary developmental defects, such as amelogenesis imperfecta or dentinogenesis imperfecta.

Known allergies or sensitivities to dental materials, including SDF.

Inability to return for recall visits.

Refusal of participation from the guardian or parents.

All the selected patients were children with primary dentition who have at least one carious tooth, a high risk of carious lesions in both anterior and posterior, and uncooperative children waiting for their turn for general anesthesia because of the difficulty of dental care performance. Patients with pain induced by caries, mobile tooth, signs of pulpal infection, medically compromised, hereditary developmental defects, known allergic reaction to SDF or other dental materials, including, inability to reoccurrence for follow-up visits should be excluded. Moreover, intra and extra-oral examinations were made, and baseline records were obtained to fill the diagnostic charts.

According to the American Academy of Pediatric Dentistry (AAPD) [14], the patient has the disease indicative factors (active caries lesion criteria which include: Patient has interproximal caries lesion(s), new non-cavitated (white spot) caries lesions, new cavitated caries lesions or lesions into dentin radiographically and restorations that were placed in the last three years or the last 12 months. As stated by AAPD they considered high caries risk patients required treatment [14].

Children with molars with active dentin caries scores (3, 4, 5) were selected

The ICDAS II criteria were used to classify active caries lesions in both groups [15].

Code Description:

0 Sound

1 First Visual Change in Enamel (seen only after prolonged air drying or restricted to within the confines of a pit or fissure)

2 Distinct Visual Changes in Enamel

3 Localized Enamel Breakdown (without clinical visual signs of dentinal involvement)

4 Underlying Dark Shadow from Dentin

5 Distinct Cavity with Visible Dentin

6 Extensive Distinct Cavity with Visible Dentin

Randomization and Allocation:

Patients included in the current trial were randomly assigned to one of the two experimental groups (simple randomization 1:1 ratio) through sequence generation and allocation concealment.

Sequence generation:

The sequence code was generated using Rondom.org.online software.

Allocation concealment

Allocation was done by the assistant supervisor where the code was written on a piece of paper folded eight times and placed in an opaque envelope with black paper inside the envelope and finally sealed to be open once the child signed the informed consent.

Blinding

The Outcome assessors and statistician were blinded about the type of treatment that the assessed patient received.

2.4 Patient preparation and material application:

Then the preparation of patients was performed, Patient was protected with a plastic-lined bib and glasses, Cotton rolls were used for proper isolation, Plastic dappen dish was used in group I (SDF) as SDF corrodes glass and metal, while in group II (NaF) was placed on the paper pod provided.

In group I (SDF), the child was positioned in a supine position on the dental chair, and any large debris was cleared from the cavity to expose the denatured dentin, facilitating better contact with SDF. To minimize contact with the gingiva and mucosa, cotton rolls were utilized to prevent potential pigmentation or irritation. A protective coating, such as Vaseline butter, was applied to the lips and surrounding skin. Subsequently, the affected tooth surfaces were dried using compressed air, ensuring a gentle flow, or cotton rolls or gauze could be used for drying. Excess liquid was removed using a micro sponge brush, bent on the side of a dappen dish. SDF was then applied solely to the affected tooth surface, and a gentle flow of compressed air was utilized for at least one minute to ensure thorough drying. Any excess SDF was carefully removed, and continuous isolation was maintained for up to three minutes whenever possible.

In group II, the application of 5% Sodium Fluoride Varnish (NAF) was performed at 1st visit and every three months, the patient's preparation procedures were performed as group I except that excessive tooth drying is not necessary. The unit-dose package of varnish was opened and was the entire content dispensed onto the round application guide provided with the packet and the applicator brush was used to mix the varnish. Then NaF Varnish was evenly applied in a thin layer on all teeth surfaces directly. After application, the patient was instructed to close his or her mouth to set the varnish and to avoid rinsing or suctioning immediately after application.

Post-operative instructions:

Participants were given standardized toothpaste and toothbrushes for both groups. In group I parents were instructed to stop eating or drinking for half to one hour, and brush with fluoridated toothpaste as a routine at night not immediately after SDF application. while in group II, parents were instructed to avoid brushing or flossing teeth for at least four hours and perfectly up to 24 hours after the treatment start brushing teeth with fluoride toothpaste the following morning, and eat soft food for the rest of the day. Also, informed about the possibility of temporary teeth discoloration.

Follow up:

Patients were recalled for:

Reapplication: For group I (SDF) reapplication was done every six months, while for group II (NaF) reapplication was done every three months [16].

Evaluation: Patients were recalled after three, six, nine, and 12 months to evaluate postoperative pain, caries arrest, and new caries.

Regular checkup: every month for oral hygiene measures.

2.5 Evaluation of Postoperative pain, caries arrest, and new caries formation:

The assessment of postoperative pain was done every visit after three, six, nine, and 12 months through patient and/or parent binary questionnaire (yes/ no) for the presence of pain and/or infection related to treated teeth. Also, the assessment of caries arrest and new caries was done after three, six, nine, and 12 months clinically using visual examination of a carious lesion color (yellow, brown, black), tactile examination of a carious lesion (hardness was assessed by applying light force with a probe to the carious lesion and the reading was recorded as soft or hard). Lesions were determined to be successfully arrested when they were hard to tactile probe and black were.

Outcome definitions:

The primary outcome was the evaluation of postoperative pain by binary questionnaire to detect the presence of pain or infection, while the secondary outcome was the evaluation of caries arrest and new caries formation using visual examination and tactile examination during clinical evaluation of a carious lesion

2.6 Statistical Analysis

Data were collected, tabulated, and statistically analyzed using Microsoft Excel ® 2016, Statistical Package for Social Science (SPSS)® Ver. 24. and Minitab ® statistical software Ver. 16. Data were revealed frequency and percentages for further analysis. The chi-square test was used in the comparison between both groups and the Spearman correlation coefficient was used to correlate between both groups with $P \leq 0.05$ considered statistically significant.

3 Results

3.1 Pain:

3.1.1 Pain existence among patients:

After three months:

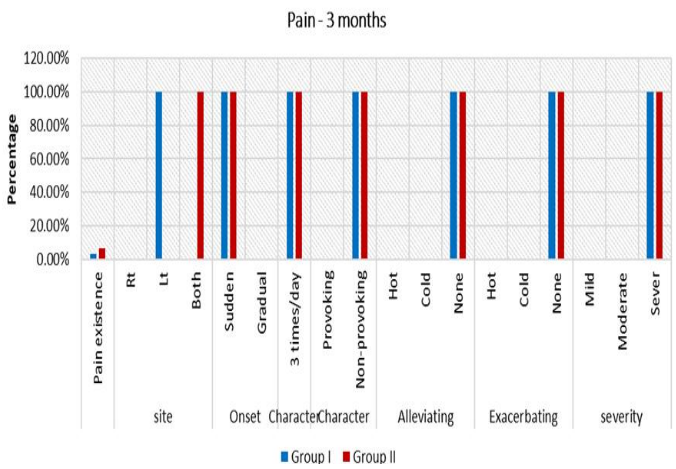

Figure 1. Pain determination in both groups after three months.

In group I, pain existed with 1 (3.2%) child only which was in left side, with sudden onset, three times frequency/day, non-provoking pain, not alleviating, not exacerbating and severe pain. While, in group II pain existed with two (6.5%) children only which was in both sides, with sudden onset, three times frequency/day, non-provoking Pain, not alleviating, not exacerbating and severe pain, as presented in **(Fig. 1)**.

Comparison between both groups revealed no statistically significant difference between them regarding all parameters except site there was a statistically significant difference with P value (P = 0.000).

After six months:

In group I, pain existed with two (9.7%) children only, with higher percent in the following; both sides (66.7%), sudden onset (66.7%), three times/day (66.7%), non-provoking (66.7%), not alleviating, not exacerbating (66.7%) and severe with (66.7%). On the other hand, in group II pain existed with six (19.4%) children only, with higher percent in the following; both sides (66.7%), sudden onset, three times/day, non-provoking, not alleviating, not exacerbating, and severe pain, as presented **(Fig. 2)**.

Comparison between both groups revealed a statistically significant difference between them regarding all parameters with P value (P = < 0.001) except pain existence and pain alleviation there was no statistically significant difference with P value (P = 0.2 - 1.00) respectively.

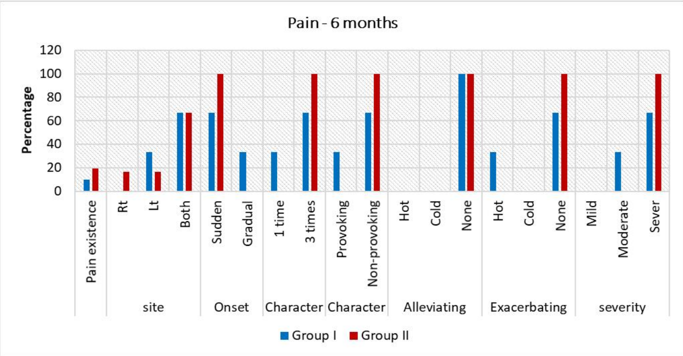

Figure 2. Pain determination in both groups after six months.

After nine months:

In group I, pain existed with one (3.2%) child only, with a higher percent in the following; both sides, sudden onset, one times/day, non-provoking, not alleviating, not exacerbating, and severe pain. In group II pain existed with three (9.7%) children only, with a higher percentage in the following; right side, gradual onset, three times/day, not provoking, not alleviating, not exacerbating, and severe pain, as presented in **(Fig. 3)**.

Comparison between both groups revealed no statistically significant difference between them regarding all parameters with P value (P= 1.00) and pain existence with P value (P= 0.31) except pain site and pain onset there was a statistically significant difference with P value (P= < 0.001*).

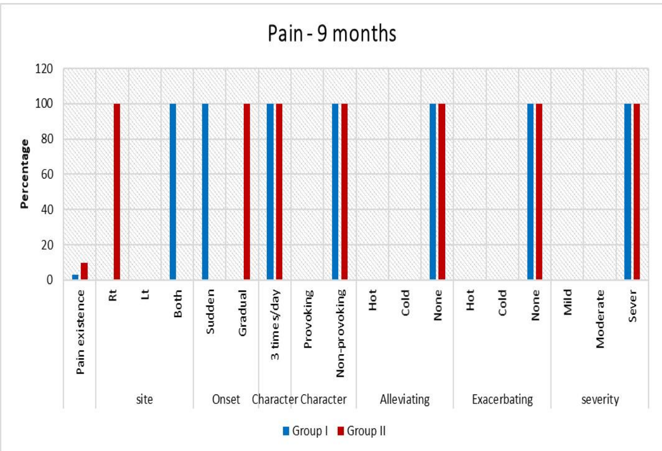

Figure 3. Pain determination in both groups after nine months.

After 12 months:

In group I, there is no pain existed, while in group II pain existed with one (3.2%) child only, with higher percent in the following; right side, sudden onset, three times/day, non-provoking, not alleviating, not exacerbating and severe pain, as presented in **(Fig. 4)**.

Comparison between both groups revealed statistically significant differences between them regarding all parameters with P value (P = < 0.001*) and no statistically significant differences regarding pain existence with P value (P =0.31).

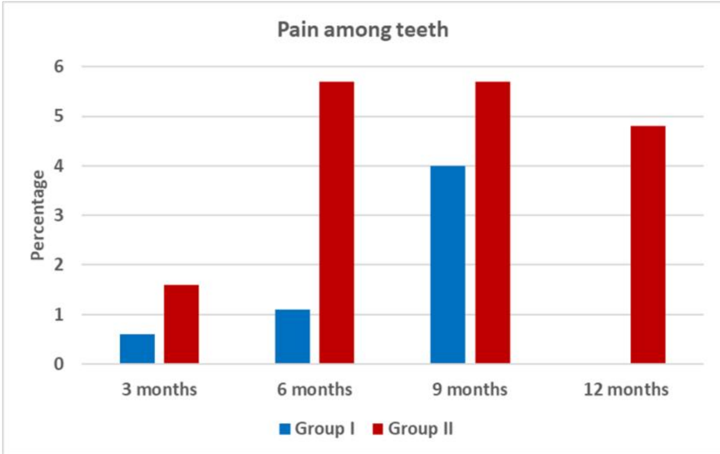

Figure 2. Pain determination in both groups after 12 months.

3.1.2 Pain existence among teeth:

In group I, at three months pain existed in one (0.6%) of teeth, the percentage increased to two (1.1%) at three months and increased to seven (4%) at nine months, then decreased to 0% at 12 months. On the other hand, pain in group II at three months was two (1.6%) then increased to seven (5.7%) at six and nine months, then decreased to six (4.8%) at 12 months as presented in **(Table 1)**.

Comparison between groups I & II regarding pain existence among teeth revealed a statistically significant difference between them at six and after 12 months with P value (P = 0.04 - 0.02) respectively as presented in **(Table 1)**.

Table 1. Pain existence among teeth in both groups.

Pain/tooth	Group I		Group II		P value
	N	%	N	%	
3 months	1	0.6	2	1.6	0.3
6 months	2	1.1	7	5.7	0.04*
9 months	7	4.0	7	5.7	0.4
12 months	0	0.0	6	4.8	0.02*

N; count %: percentage
*; significant (p ≤ 0.05), non-significant (p>0.05)

3.2 Caries arrest:

In group, I, the percentage of hard caries increased during different follow-up periods as it was (21.1%) at baseline and reached (91.4%) at 12 months, while soft caries decreased during follow-up as it was (78.9%) at baseline and reached (5.1%) at 12 months as presented in **(Table 2)** and **(Fig. 5)**. Comparison between hard and soft caries in group I using the chi-square test revealed a statistically significant difference between them during different follow-up periods with a P value (P = < 0.001*) as presented in **(Table 2)** and **(Fig. 5 & 6)**.

In group II, the percentage of hard caries decreased during different follow-up periods as it was (46.3%) at baseline and reached (42.3%) at 12 months, while soft caries decreased during follow-up as it was (53.7%) at baseline and reached (41.5%) at 12 months as presented in **(Table 2)** and **(Fig. 6)**. Comparison between hard and soft caries in group II using the chi-square test revealed no statistically significant difference between them during different follow-up periods with a P value (P = 0.41) as presented in **(Table 2)** and **(Fig. 5 & 6)**.

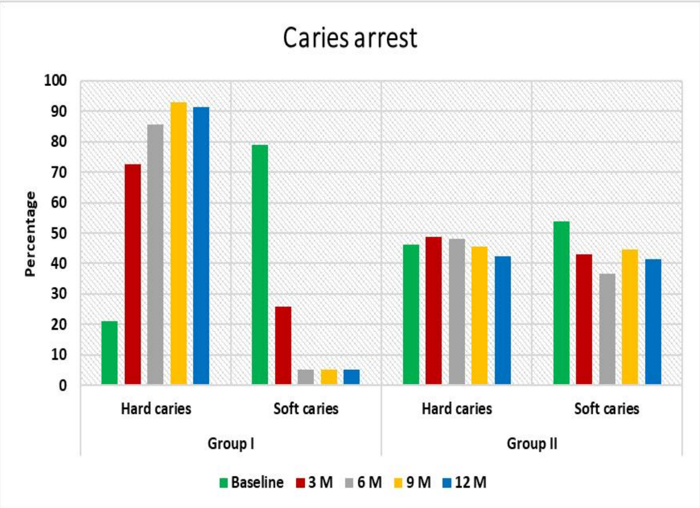

Figure 5. Caries arrest in both groups.

Comparison between both groups at different follow-up periods using the chi-square test revealed a significant difference between hard and soft caries with a P value (P< 0.001*) as presented in **(Table 2)**.

Table 2. Comparison between groups I & II regarding caries arrest.

		Group I		Group II		*P* value
		N	%	N	%	
Hard caries	0	37	21.1	57	46.3	< 0.001*
	3 M	127	72.6	60	48.8	< 0.001*
	6 M	150	85.7	59	48.0	< 0.001*
	9 M	163	93.1	56	45.5	< 0.001*
	12 M	160	91.4	52	42.3	< 0.001*
Soft caries	0	138	78.9	66	53.7	< 0.001*
	3 M	45	25.7	53	43.1	< 0.001*
	6 M	9	5.1	45	36.6	< 0.001*
	9 M	9	5.1	55	44.7	< 0.001*
	12 M	9	5.1	51	41.5	< 0.001*

N; count %: percentage
*; significant (p ≤ 0.05), non-significant (p>0.05)

3.3 New caries:

In group I the highest new caries percentage was at nine months (3.8%), then decreased to (0%) at 12 months. While in group II, the highest percentage was at six months (4.7 %) then decreased to (3.3%) at 12 months as presented in **(Table 3)**.

Comparison between new caries in different follow-up periods in each group using the chi-square test revealed a statistically significant difference with P value (P = 0.001*) in both groups as presented in **(Table 3)**.

Table 3. New caries in both groups.

	Follow up	N	%	*P* value
Group I	Baseline	0	0.00%	0.001*
	At 3 months	1	0.6%	
	At 6 months	1	0.6%	
	At 9 months	7	3.8%	
	At 12 months	0	0.00%	
Group II	Baseline	0	0	0.001*
	At 3 months	3	2.0%	
	At 6 months	7	4.7%	
	At 9 months	5	3.3%	
	At 12 months	5	3.3%	

N; count %: percentage
*; significant (p ≤ 0.05), non-significant (p>0.05)

Comparison between both groups regarding new caries at different follow-up periods using the chi-square test revealed a statistically significant difference at six months and at 12 months with *P* value ($P < 0.01$*). While, there was no statistically significant difference at baseline, at three months and nine months with *P* value (P = 0.2 & 0.8) respectively in both follow-ups as presented in **(Table 4)**.

Table 4. Comparison between both groups regarding new caries.

New caries	Group I		Group II		*P* value
	N	%	N	%	
Baseline	0	0.0	0	0.0	1
At 3 months	1	0.6	3	2.0	0.2
At 6 months	1	0.6	7	4.7	0.01*
At 9 months	7	3.8	5	3.3	0.8
At 12 months	0	0.00	5	3.3	0.01*

N; count %: percentage
*; significant (p ≤ 0.05), non-significant (p>0.05)

4 Discussion

In the present study, the selected patients were less than six years old. This age range was decided to ensure that they only have primary teeth. Delayed dental treatment and overall caries arrest in children of this age group are very effective and useful due to reducing expected pain and infection, with subsequent need for expensive future emergency intervention under general anesthesia or traumatic dental experiences on uncooperative children [3].

This agrees with several researches which found no statistically significant difference in the demographic background including gender and age and chief complaints between children who were examined at baseline and remained at the end of the study. That plays a great role in standardization for more accurate results and to avoid bias [17,18].

This study included two types of fluoride varnish (38% silver diamine fluoride and 5 % sodium fluoride varnish). All patients used the same toothpaste and toothbrush to standardize the effect on tooth structure.

A 5% sodium fluoride varnish was chosen as the control group. This decision was based on previous findings indicating that the caries arrestment proportion for sodium fluoride varnish alone was 84.4%, while when combined with chlorhexidine mouthwash, it was 85.3% [19].

A 5 % sodium fluoride varnish was applied every three months as recommended by the American Academy of Pediatric Dentistry AAPD [14] Also, Canga et al., 2019 [20] stated that the best results were achieved in the treatment with 5 % NaF fluoride within a 3-month periodicity [20].

In the present study, a 38% silver diamine fluoride solution was utilized as the intervention group. This decision was based on guidance from the American Academy of Pediatric Dentistry [14], which indicates that Silver Diamine Fluoride (SDF), a brush-on liquid, can arrest approximately 87.7% of dental caries lesions. Furthermore, it's noted that the success rate of SDF in arresting caries lesions is comparable to that of restorations performed under general anesthesia [21]. Stopping lesion progress (caries arrest) appears to have the same effect on preventing pain from the lesion as restoration, but this needs to be studied further [21].

When planning the application of SDF, it was crucial to consider and adhere to important recommendations reported in the literature. Firstly, the counter was covered with a plastic-lined bib to prevent staining. Additionally, a protective coating, such as Vaseline butter, was applied to the lips and skin to prevent temporary black stains that could occur if soft tissues came into contact with SDF. Proper isolation of the areas to be treated with cotton rolls or gauze was essential to ensure adequate isolation of gingival tissues, as some adverse reactions had been reported due to contact of SDF with the gingiva. This practice also helped minimize systemic absorption of the solution [22].

Silver diamine fluoride was applied biannually (every six months) because a single application of SDF is less effective than a double application. Although variability in arrest rates was observed among tooth types and locations, arrest rates in all situations were higher after two applications [10].

This present study assessed silver diamine fluoride (SDF) versus sodium fluoride varnish (NaF) effectiveness in dental caries lesions arresting in primary teeth. Because the current treatment strategies have directed to and trying to utilize demineralizing in arrest dental decay and a less invasive approach rather than the classical invasive restorative treatment. Assessment of the effect of SDF and NaF in arresting caries lesions has relied on characteristics of color and consistency (hard/soft) of the lesions [3,10,23].

Histological examinations revealed that applying gentle pressure was essential for assessing lesion hardness without compromising the surface integrity of non-cavitated lesions. It was not necessary to verify whether the explorer would penetrate the lesion [3,23]. Group I had a higher caries arrest rate than group II [22]. Furthermore, it was shown that SDF can prevent demineralization and maintain the collagen of demineralized dentin by creating a protective layer within and above the dentinal tubules. The antimicrobial properties of silver diamine fluoride are primarily attributed to silver ions, which reduce oral bacteria growth and prevent the denaturation of enzymes that degrade collagen in dentin. Additionally, fluoride facilitates the deposition of fluorapatite, enhancing resistance to acidic degradation beyond that of normal tooth structure [25,26]. The present study also comes in agreement with Clemens et al, 2018 [3] who found in their study caries arrest rate was 98.0%. Furthermore, our study agrees with Fung et al., 2018 [17] who concluded that treating caries teeth by SDF application increases the chance of caries lesions being arrested in the control group [3,17].

Similarly, Trieu et al., 2019 [27] reported SDF was found to be statistically more effective in dentin caries arrest of primary teeth during 30-month clinical examinations if compared with NAF. Accordingly, the postoperative pain increased in group II than in group I in all follow-up periods with a statistically significant difference after six and after 12 months only. In addition, stopping the progress of carious lesions (caries arrest) appears to have the same effect on pain prevention [3,17,27].

Moreover, in visual examination of caries arrest statistically significant difference between both groups during (three, six, nine, 12) was revealed, which is approved by several studies which stated that the dentin caries lesions blackening and hardening also occurred in children in children receiving 5 % NaF varnish. Although all arrested caries lesions appeared similar, discoloration of teeth following SDF application was noted as a consequence of caries arrest in numerous studies [27]. It was reported that teeth showed discoloration after a single application of SDF. Likewise, another study observed that all children in the SDF group presented with discolored treated teeth at their next visit after three weeks. Additionally, the Black stain was frequently observed in SDF-treated lesions, particularly with higher concentrations of SDF (38%) and with repeated application as presented in **(Fig. 6)** [3,29-31].

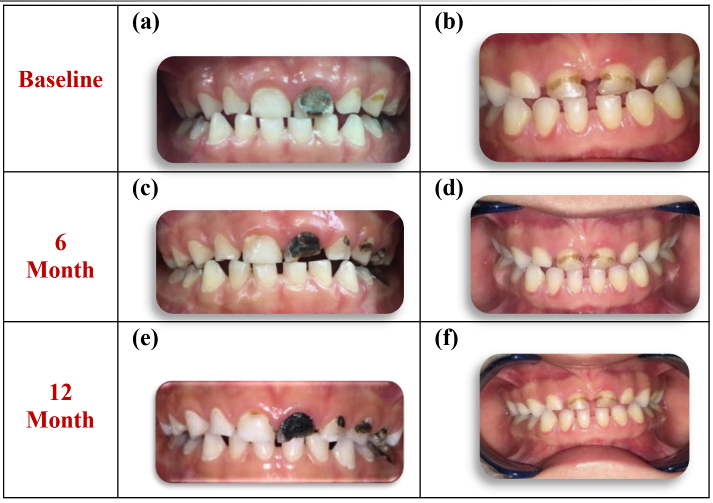

Figure 6. A Photograph showing group I (SDF): (a) Baseline photo for anterior teeth before application. (c) After six months with black discoloration in treated teeth. (e) After 12-months application with increased black discoloration in treated teeth

A Photograph showing group II (NaF): (b) Baseline photo before application. (d) After six months with slight brown discoloration in treated teeth. (f) After 12 months brown discoloration in treated teeth.

In this study, the highest percentage of new caries development was observed in group II than in group I with statistically significant differences at six and 12 months, which agrees with several studies that demonstrated that 38% of SDF applications decrease new caries progress in children treated with it about non-treated children. Other previous studies found a great decrease in the incidence of new caries in children treated with SDF in non-treated children. Although great reduction in new caries progress with SDF treatment, no studies have demonstrated an absolute reduction. Therefore; this study emphasized the importance of good oral hygiene maintenance in conjunction with SDF treatment [5,32].

One of the limitations of the study is the inability to control some demographic factors which may affect their response to instructions such as socioeconomic standard and educational level. However, the use of standardized instructions and toothbrush and paste eliminated the possibility of bias in this study.

This paper demonstrated that Silver Diamine Fluoride is a non-complicated, non-dangerous, noninvasive, and highly accepted treatment for uncooperative patients despite teeth type or location.

Proper case selection of sodium fluoride varnish can successfully arrest caries. Regardless of its great success parents may refuse the staining from SDF in anterior teeth considering it esthetically unacceptable discoloration. But they will accept the discoloration to avoid needing general anesthesia.

5 Conclusion

The application of SDF is a conservative option in caries management among populations where surgical management of decay is not possible. A 5 % NaF is effective but less than SDF varnish.

Authors' Contributions

Marwa A. Salamoon: manuscript writing and concepts

Mohamed Hamdi Aboelyamin: manuscript writing and design

Nevine G. Waly: clinical work supervisor

Eman S. Elmasry: clinical work supervisor

Fatma Abdelgawad: clinical work supervisor

All authors have read and approved the manuscript.

Informed consent

The patients signed an informed consent.

Conflict of interest

The authors declare that they hold no competing interests.

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