

## Original Research

### Comparing the efficacy of sodium fluoride and silver diamine fluoride in arresting caries

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#### ABSTRACT:

**Background:** To assess the efficacy of sodium fluoride and silver diamine fluoride in arresting caries. **Materials & methods:** 20 demineralised dentine blocks were enrolled and were broadly divided into two categories with 10 specimens in each group; Group A- Treated with SDF while Group B- Treated with NaF. All the blocks were subjected to a Streptococcus mutans biofilm challenge. Lesion depth, precipitates' characteristics and matrix (collagen)-to-mineral ratio were evaluated by micro-computer tomography (micro-CT). All the results were recorded in Microsoft excel sheet and were analysed using SPSS software. **Results:** Mean depth of the lesions was 169.5 µm among the group A specimens while it was 208.4 µm among group B specimens. While analysing statistically, significant results were obtained. **Conclusion:** Silver diamine fluoride is a more effective caries management reagent than Sodium fluoride.

**Key words:** Sodium fluoride, Silver diamine, Caries

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#### INTRODUCTION

Dental caries is a localised chemical dissolution of dental hard tissues that is caused by acidic by-products of the metabolic processes of the biofilm (dental plaque) covering an affected tooth surface. Enamel caries refers to the dissolution of highly mineralised tissue as a result of attack by bacterial acid, whereas that in dentine involves both mineral demineralisation and organic matrix degradation of the type I collagen fibre network. Silver diamine fluoride (SDF) is used to prevent and arrest caries, and "silver diamine fluoride" is the most common spelling/keyword for this compound in the dental literature.<sup>1-3</sup>

Topical fluorides, such as NaF varnish, are used as preventive reagents because of their remineralization and antimicrobial abilities. Topical silver diamine fluoride is a clear liquid that is painted on the active lesion surface in milligram amounts and arrests the lesion. Cleared by the Food and Drug Administration in 2014 as a treatment for sensitive teeth and used off-label for the treatment of cavities in the United States since 2015, 12 clinical trials outside the United States have documented caries arrest. Moreover, preventive

benefits extend to unaffected teeth. Serum concentrations of fluoride and silver after topical application revealed no potential toxicity.<sup>4-7</sup> Hence; the present study was conducted for evaluating the efficacy of sodium fluoride and silver diamine fluoride in arresting caries.

#### MATERIALS & METHODS

The present study was conducted for evaluating the efficacy of sodium fluoride and silver diamine fluoride in arresting caries. In the present study, a total of 20 demineralised dentine blocks were enrolled and were broadly divided into two categories with 10 specimens in each group; Group A- Treated with SDF while Group B- Treated with NaF. All the blocks were subjected to a Streptococcus mutans biofilm challenge. Lesion depth, precipitates' characteristics and matrix (collagen)-to-mineral ratio were evaluated by micro-computer tomography (micro-CT). All the results were recorded in Microsoft excel sheet and were analysed using SPSS software.

## RESULTS

In the present study, a total of 20 demineralised dentine blocks were enrolled and were broadly divided into two categories with 10 specimens in each group; Group A- Treated with SDF while Group B- Treated with NaF. Mean depth of the lesions was 169.5µm among the group A specimens while it was 208.4 µm among group B specimens. While analysing statistically, significant results were obtained.

**Table 1: Depth of the lesion**

Variable	Group A	Group B
Mean depth of lesion (µm)	169.5	208.4
SD	23.5	37.4
p- value	0.001 (Significant)	

## DISCUSSION

Dental caries is a painful condition that could lead to nutritional problems which effect the general health of the child, as well it is costly to treat. Early childhood caries has been presented by the World Health Organization (WHO) as a worldwide condition. It was reported that the prevalence of this disease is between 60% and 90%. Moreover, the statistics issued by the European countries have showed that 61% of children (6–12) years old have at least one tooth affected with dental caries. Conservative management is the modern approach in managing dental caries. It includes: the early recognition of non-cavitated lesions, identifying the child's caries risk, identifying the activity of the disease, valid and reliable surveillance to select the appropriate conservative approaches and monitoring the signs of caries arrest or the progression of the carious lesions. There are a number of different nomenclatures for this dental product: 'silver diamine fluoride' 'diammine silver fluoride' 'silver diammine fluoride' 'diamine silver fluoride or silver fluoride' and 'silver ammonium fluoride'.<sup>6- 10</sup>Hence; the present study was conducted for evaluating the efficacy of sodium fluoride and silver diamine fluoride in arresting caries.

In the present study, a total of 20 demineralised dentine blocks were enrolled and were broadly divided into two categories with 10 specimens in each group; Group A- Treated with SDF while Group B- Treated with NaF. Mean depth of the lesions was 169.5 µm among the group A specimens while it was 208.4 µm among group B specimens. While analysing statistically, significant results were obtained. Yu OY et al investigated the remineralising effect and bacterial growth inhibition of 38% silver diamine fluoride (SDF) solution and 5% sodium fluoride (NaF) varnish on artificial dentine caries lesions. Demineralised dentine blocks were treated with SDF + NaF (Group 1), SDF (Group 2), NaF (Group 3) and water (Group 4) and subjected to a *Streptococcus mutans* biofilm challenge. Lesion depth, precipitates' characteristics and matrix (collagen)-to-mineral ratio were evaluated by micro-computer tomography (micro-CT), X-ray diffraction (XRD) and Fourier transform infrared spectroscopy

(FTIR), respectively. The biofilm kinetics, viability and topography were assessed by counts of colony forming units (CFUs), confocal laser scanning microscopy (CLSM) and scanning electron microscopy (SEM), respectively. Data were analysed by two-way ANOVA test. The lesion depths of Groups 1-4 were 170 ± 28 µm, 160 ± 32 µm, 353 ± 38 µm and 449 ± 24 µm, respectively. The addition of NaF to SDF did not show better remineralisation than SDF (p = 0.491). Metallic silver and silver chloride were found in Groups 1 and 2. The amide I-to-hydrogen phosphate ratios of the four groups were 0.14 ± 0.02, 0.14 ± 0.01, 0.29 ± 0.05 and 0.49 ± 0.16, respectively, and the addition of NaF to SDF did not offer better protection against collagen exposure than SDF (p = 0.986). The Log<sub>10</sub> CFUs of Groups 1-4 were 5.75 ± 0.56, 4.49 ± 0.57, 6.55 ± 0.39 and 6.40 ± 0.38, respectively. The presence of NaF reduced the antibacterial effect of SDF (p < 0.001). The SEM and CLSM images supported the findings. Application of SDF with or without NaF reduced the demineralisation of dentine caries, but SDF exerted stronger inhibition of biofilm growth than SDF with NaF.<sup>11</sup>

Trieu A et al systematically reviewed the dentine caries arrest capabilities of silver diamine fluoride (SDF) and sodium fluoride (NaF). A comprehensive search strategy was developed to identify the relevant publications in electronic databases and hand searched journals and reviews (to March 2018). By applying strict inclusion and exclusion criteria, only six papers (two randomized controlled trials, two follow-up articles and two secondary statistical analysis studies) were considered for full text qualitative and quantitative assessment. The included studies were critically appraised and statistically evaluated. Only four articles were considered for meta-analysis, as the other two were secondary analyses of included studies. When comparing the caries arrest lesions of SDF and NaF, SDF was found to be statistically more effective in dentine caries arrest of primary teeth during the 18 and 30 month clinical examinations. The weighted total effect size of the differences between SDF and NaF regarding arrested caries surfaces was calculated and showed nearly double the effectiveness of SDF to NaF at 30 months.<sup>12</sup>

## CONCLUSION

Silver diamine fluoride is a more effective caries management reagent than Sodium fluoride.

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