

PREVENTION OF EARLY CHILDHOOD CARIES USING SILVER DIAMINE FLUORIDE IN SOUTH ASIAN COUNTRIES: A SYSTEMATIC REVIEWShailanadhan R¹, Sasikala M², Raj Mohan M³, Prabu D⁴, Sindhu R⁵¹Bachelor of Dental Surgery, SRM Dental College, Ramapuram, Chennai, India.²Master of Dental Surgery, Department of Public Health Dentistry, SM Dental Clinic, Tiruvallur, India.³Master of Dental Surgery, Reader, Department of Public Health Dentistry, SRM Dental College, Ramapuram, Chennai, India.⁴Master of Dental Surgery, Professor and Head, Department of Public Health Dentistry, SRM Dental College, Ramapuram, Chennai, India⁵Master of Dental Surgery, Senior lecturer Department of Public Health Dentistry, SRM Dental College, Ramapuram, Chennai, India**Received: 08-10-2021 / Revised: 12-11-2021 / Accepted: 14-12-2021****Corresponding author:** Dr. Prabu D**Conflict of interest:** Nil**Abstract**

Early childhood caries has been regarded as one of the most prevalent chronic diseases in the childhood. It is often neglected and left untreated due to improper knowledge about the disease which leads to pain, discomfort, inability to eat and hence leading to malnutrition and leads to get caries in its successor permanent teeth.

Aim: To assess the efficiency of silver diamine fluoride in the treatment of early childhood caries.

Methodology: A literature review was performed using Medline, PubMed, science direct, Cochrane, using keyword "Early childhood caries AND silver diamine fluoride". According to the prisma guidelines the mesh terms were altered in each search engines.

Results and Conclusion: In the available literature, biannual application of topical application of 38% of silver diamine fluoride is more effective in arresting early childhood caries

Keywords: early childhood caries, children, silver diamine

I. Introduction

Early childhood caries is one of the most prevalent chronic disease in the childhood. It is a serious issue among children. It is caused due to artificial pacifiers, poor feeding habits, dietary sugars, poor oral hygiene, poor parental control, low socio-economic status all related to early childhood caries in

preschool children.[1] In south East Asia, A study reported that almost half (47%) of the population from 25-30 months suffered of Early childhood caries.[2]

The traditional way to manage early childhood caries which involves minor

surgical procedures like removal of infected and affected dental tissues followed by filling of cavity using bio-compatible substances which effectively prevents from further progression of the disease to its successors. As many of the children doesn't cooperate for the long procedures for the treatment and many parents cannot afford for their child's treatment because of the socio-economic status. Nowadays dentistry plays an important role as the procedures are too short in time and are most cost effective so that everyone can utilize for improving their child's oral health.

There are various methods for arresting caries like using of xylitol chewing gums, fluoridated toothpastes, mouth rinses, and application of topical fluorides. Application of topical fluorides generally does not requires long procedures and can be done even in on clinical environment. Fluorides are self-applied in home and professionally applied by health professionals.

Topical application of silver diamine fluoride getting more attention among health professionals due to its unique properties. It is a colourless ammonia solution containing silver and fluoride ions. Silver ion is usually unstable so that it is usually mixed with water which contains ammonia so that it forms a strong complex and stable.[3] It consists of antibacterial properties which controls growth of cariogenic bacterial biofilms.[4] 38% SDF is usually used for arresting caries and followed in China, Japan, Hong Kong. 38% of silver diamine fluoride contains high amount of fluoride content (44,800ppm). So if it is used beyond this limit then there will to more chance of dental fluorosis. If it is been applied occlusal then the content will be increased which leads to toxicity.[5]

Most of the health professionals use silver diamine fluoride over other topical fluorides due to its **i.** economically less **ii.** Requires less time, **iii.** Most effective. **iv.** Good antibacterial agent.

Objectives

To assess silver diamine fluoride as a preventive measure in arresting early childhood caries.

Materials and Methods

Many randomized control studies and pilot studies with interventions were included in the study with inclusions and to get definitive results.

Eligibility criteria:

Inclusions:

- i. Studies from 2000 – present were included to get recent advances in treatment
- ii. Full text articles available.
- iii. Studies from south Asian countries
- iv. Studies in English language

Exclusions:

- i. Studies taken other than south Asia
- ii. The studies which does not take silver diamine fluoride as preventive measure for early childhood caries.
- iii. Studies which are in other than English language.

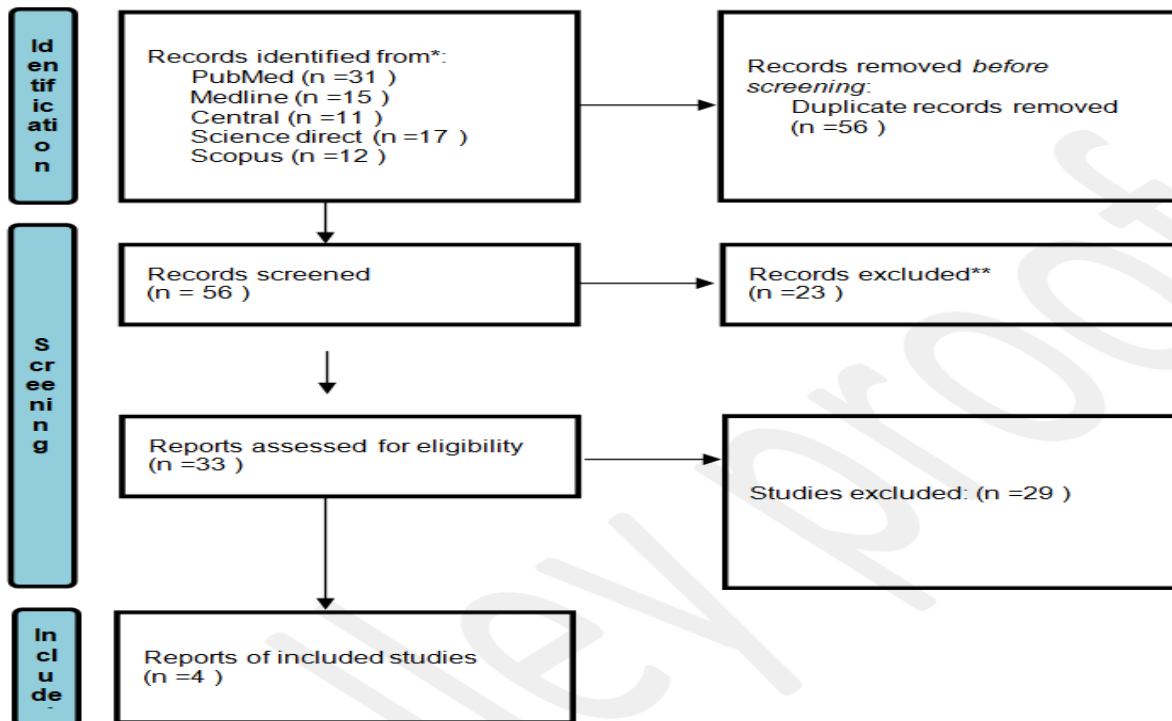
Search strategy:

Published results on prevention of early childhood caries by using silver diamine fluoride which includes original articles and research papers in databases such as Pubmed Central, Science direct, Cochrane Central Register of Controlled Trials (CENTRAL) were taken into study for review in October 2018. A literature search to collect relevant data was performed using keyword "Early

childhood caries AND silver diamine fluoride". According to the prisma guidelines

the mesh terms were altered in each search engines went the results too many or too less.

Figure 1: Showing The Number Of Datas Included And Studies Taken For Qualitative Analysis



Results

The search yielded 86 articles and 4 full text articles were independently assessed among these eligible articles. Three tables were included, figure 1 shows flow diagram of the reports identified, screened, assessed for eligibility, excluded and included for the review.

Table 1 shows the characteristics of interventions in the included studies. All the studies discussed differed individually with

sample size, from various schools, all the children included were advised to use fluoridated toothpastes.

Table 2 shows the outcome data of effectiveness of silver diamine fluoride in arresting of early childhood caries.

Table 3 shows the bias shown in all the studies including in the study which was categorized as high bias, low bias and unclear. The bias was categorized according to its norms.

Table 1: Characteristics Of Interventions In The Study

Author Name	Year	Sample Size	Duration	Interventions
Yee.R[6]	2009	976	24 months	Group 1- 36% topical SDF application without reducing agent Group 2 - 36% topical SDF with tea as reducing agent Group 3 - 12% topical SDF without reducing agent Group 4 - control group
Fung [8]	2016	888	18 months	Group 1- 12% SDF application annually Group 2 - 12% SDF application biannually Group 3 - 38% SDF application annually Group 4 - 38% SDF application biannually
Duangtip[9]	2016	304	18 months	Group 1- 30% SDF application once an year Group 2 - 3 applications of 30% SDF application at weekly intervals Group 3 - 3 applications of NaF at weekly intervals.

Table 2: Characteristics of Outcome and Results

Author Name	Year	Primary Outcome	Result
Yee.R[6]	2009	Primary outcome – decrease in carious surface	At 6,12,24 months the arrested carious surface in 38% SDF groups were higher than 12% SDF and control groups. There was so significant change between 38% SDF and 38% SDF with tannic acid.
Zhi.R[7]	2012	Primary outcome – control in caries formation	At 24 months the rates were 84%,91%,82% respectively stating that biannual application of SDF decreases caries rate whereas the annual application of SDF and GI does not differ.
Fung[8]	2016	Primary outcome – increase in caries arrest rate	At 18 months, the children receiving biannual application had higher chances of arrest of caries compared with annual application and annual application children had high chances when compared with the children receiving 12% SDF.
Duangtip [9]	2016	Primary outcome – decrease in rate of caries formation	At 24 months, the children receiving biannual applications and 3 applications of SDF are more effective than 3 applications of NaF varnish.

Table 3: Characteristics of Bias In Different Studies Taken For Review

Author name	Random sequence generation	Allocation concealment	Binding of outcome	Incomplete outcome	Selective bias	Other bias
Yee.R[6]	++	++	+	+	+	+
Zhi.R [7]	++	++	++	+	+	++
Fung[8]	++	++	?	+	+	+
Duangtip [9]	++	+	++	+	+	+

- + Low risk
- ++ High risk
- ? Unclear

Discussion

Our search had several studies arguing that silver diamine fluoride is the best preventive measure for arresting early childhood caries and there were many review articles and randomised control studies regarding this and there was no specific characteristics for the study group. In the 4 studies taken the results were sodium diamine fluoride was the best preventive measure in controlling early childhood caries concluding that the preventive measure is more effective.

Yee (2009) has done the first clinical trial to evaluate the effectiveness of a one-time application of SDF with 2 different concentrations of SDF and the effect of reducing agent. The results of this study for the application of 12% SDF, in that this agent had no significant effect on arresting caries. 38% SDF of single application, with or without the use of tea as a reducing agent, was significantly more effective in arresting dental caries in both the posterior and anterior dentitions of children than 12% SDF and no application (control). 38% SDF of arresting

caries decreases slowly over time. A single application of 38% SDF was sufficient to prevent only 50% of the arrested surfaces at 6

months from reverting to active lesions again over 24 months. The tannic acid from boiled tea does not appear to have any significant additional effect on arresting caries compared with 38% SDF alone. The main disadvantage is discolouration of tooth surface which can be eliminated by application of potassium iodide after application of SDF.[10] The outcome after 24 months of clinical studies shows that 38% SDF application annually is effective on arresting caries but the effectiveness reduces over time. The use of reducing agent along with SDF have no additional effective and 12% SDF application is ineffective and control group had high progression of caries.

Zhi (2012) has compared application of SDF with application of flowable glass ionomer cement and it was the first study to investigate the effect of annual paint of a flowable glass ionomer to arrest active carious lesions of primary dentition and thought that this would be as beneficial as application of SDF. Though it takes more time for manipulation, it would provide an alternate treatment when application of SDF is not accepted due to its taste or blackening effect. At end of 24 months, the full retention of GI cement found only at 3.5% of population due to its poor stability. The results were biannual application of SDF increases the carious

arrest rate and annual application of SDF and GI cement have equal significance.

Fung (2016) has compared with different concentration on a 2x2 factorial design i.e. 2 factors taken with 2 levels for comparative study. At end of 18 months it is found that biannual application of SDF is more effective compared to annual application. The annual application is 24% more effective when compared with 12% SDF application.

Duangtip (2016) has compared application of SDF annually with 3 times application of topical SDF solution and 3 times application of sodium fluoride varnish application as the study group has high prevalence to caries. At the study the caries started getting arrested without even the re application of the fluorides in 3 applications of SDF and NaF varnish due to other sources of fluoride and child's development. At end of the study it shows that biannual application of SDF have been more effective when compared to annual application and SDF application is better for arresting caries when compared to NaF varnish application.

Conclusion

The study concluded stating that biannual application of topical application of 38% of silver diamine fluoride is more effective in arresting early childhood caries when compared with annual application and other sources meant for prevention of the caries. It is effective only when applied twice a year.

References

1. Chu CH 2000: Treatment of early childhood caries: a review and case report. *Gen Dent.* 48(2):142-148.
2. van Palenstein Helderma WH, Soe .W, van't, ,Hoe MA, 2006. Risk factors of early childhood caries in a South east

Asian population. *J Dent Res* 85(1):85-88.

3. Mei ML, Ito L, Cao Y, Li QL, Lo EC, Chu CH. 2013. Inhibitory effect of silver diamine fluoride on dentine demineralisation and collagen degradation. *J Dent.* 41(9):809–817.
4. Mei ML, Chu CH, Low KH, Che CM, Lo EC. Caries arresting effect of silver diamine fluoride on dentine carious lesion with *S. mutans* and *L. acidophilus* dual-species cariogenic biofilm. *Medicina oral, patologia oral y cirugia bucal.* 2013 Nov;18(6):e824.
5. Mei ML, Lo EC, Chu CH. 2016. Clinical use of silver diamine fluoride in dental treatment. *Compend Continu Educa Dent.* 37(2):93–98.
6. Yee R, Holmgren C, Mulder J, Lama D, Walker D, van Palenstein Helderma W. 2009. Efficacy of silver diamine fluoride for arresting caries treatment. *J Dent Res:*88(7):644–647
7. Zhi QH, Lo EC, Lin HC. 2012. Randomized clinical trial on effectiveness of silver diamine fluoride and glass ionomer in arresting dentine caries in preschool children. *J Dent.* 40(11):962–967.
8. Fung MH, Duangthip D, Wong MC, Lo EC, Chu CH. Arresting dentine caries with different concentration and periodicity of silver diamine fluoride. *JDR Clinical & Translational Research.* 2016 Jul;1(2):143-52.
9. Duangthip D, Chu CH, Lo EC. A randomized clinical trial on arresting dentine caries in preschool children by topical fluorides—18 month results. *Journal of dentistry.* 2016 Jan 1;44:57-63.
10. Knight GM, McIntyre JM, Craig GG, Mulyani, Zilm PS, Gully NJ (2005). 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 50:242-245.