

# Effect of Silver Diamine Fluoride Treatment on the Quality of Life of Children

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## Abstract

**Background:** Early childhood caries is known to affect the quality of life of children. Silver diamine fluoride is a desensitizing agent used for preventing and arresting dental caries. It is inexpensive and can be easily applied.

**Aim:** The aim of the present study was to find the effect of Silver Diamine Fluoride (SDF) treatment on the Oral Health-Related Quality of Life

**Method:** ECHOIS questionnaire designed to evaluate the child's behavior, physical abilities, pain, temperament, and how well the child gets along with other people was distributed to the parents of children aged 1-5 with ECC with reversible pulpitis. The questionnaire has two components ie Family Impact Score and Child Impact Score. The parents were asked to fill the questionnaire at baseline and one month after SDF application.

**Results :** Significant difference was observed in the mean Child Impact Score(CIS) and Family Impact Score(FIS) at baseline and one month follow up. SDF application significantly improved the quality of life of children( $P<0.005$ ). Wilcoxon Signed Rank Test was used to check the level of significance in the mean difference of the CIS and FIS at the base line and one month follow up

**Conclusion:** Children with ECC after the application of SDF showed improvement in the quality of life at one-month follow up compared with the baseline as measured by ECHOIS questionnaire

**Keywords:** Dental caries, Silver diamine fluoride, Children, Quality of life

## Introduction

Early Childhood Caries (ECC) has been defined as "the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a child 71 months of age or younger<sup>(1)</sup>. ECC can affect children's lives, such as

physical development, emotional growth, quality of life, and learning at school. Those children seek dental care due to pain and discomfort. They often need extensive dental treatment under conscious sedation or general anesthesia, due to their inability to cooperate in a clinical setting<sup>(2,3)</sup>.

Silver Diamine Fluoride (SDF) is an FDA approved desensitizing agent. 38% Ag (NH<sub>3</sub>)<sub>2</sub>F is a colorless solution which contains 24–29% silver and 5–6% fluoride with pH of 10. This high alkalinity provides an unfavorable environment for dentine collagen enzyme activation<sup>(4)</sup>. SDF is inexpensive and the treatment is very simple and non-invasive. It kills cariogenic bacteria and provides instant caries arrest thereby reducing pain and infection in children<sup>(5)</sup>. SDF is proven to be

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effective in preventing and arresting dental caries both for the primary teeth<sup>(6,7)</sup> and the permanent teeth in older children<sup>(8)</sup>. It is also effective in the prevention of root caries in the elderly<sup>(9)</sup>.

Oral health related quality of life (OHRQoL) is a multidimensional construct that reflects people's comfort when eating, sleeping, and engaging in social interaction, their self-esteem, and their satisfaction with respect to their oral health<sup>(1)</sup>. Pain in the teeth, mouth or jaws, irritation or frustration, difficulty eating and trouble sleeping are the most common impacts of ECC on OHRQoL as reported by parents<sup>(10,11)</sup>.

The Early Childhood Caries Oral Health Impact Scale (ECOHIS) is a standardized instrument that has been used to measure OHRQoL. ECOHIS consists of two subscales: CIS (Childhood Impact Scores) and FIS (Family Impact Scores). CIS show the impact of dental caries on the child and FIS demonstrate the impact of dental caries on the family<sup>(12)</sup>

The objective of the present study was to investigate the Oral Health-Related Quality of Life (OHRQoL) in preschool children with dental caries who had an application of SDF. The hypothesis of the present study was that silver diamine fluoride treatment cannot improve the quality of life of children with Early Childhood Caries.

## Materials and Method

The current short terms study was approved by Institutional Review Board(IHEC/SDC-PEDO1703/19/023). A total of 30 healthy participants (ASA I and II), aged between 2-5 years with ECC who visited the Department of Pediatric Dentistry were included in the present study.

### Inclusion criteria:

- Children who were difficult to treat due to behavior or medical management
- Involvement of multiple teeth that may not be treated in one visit
- Who can be benefitted from caries arrest and monitored until the patient is old enough able to cooperative for the treatment or until their appointment for treatment under GA

- High risk for developing more caries

### Exclusion criteria:

- Children who are cooperative enough to have definitive treatment in clinical set up
- Medically compromised children
- silver allergy
- Children with ulcerative gingivitis or stomatitis.

The participants were recruited after explaining the study design, risks and benefits of SDF application, and the study forms were explained thoroughly to the parents and informed consent was obtained from parents prior to application of SDF. After obtaining consent from the parents, 38%SDF (Tedequim SRL., Argentina) was applied to the cavitated tooth surface after proper isolation with cotton rolls.

ECHOIS questionnaire consisting of 13 oral health-related behaviors and various questions related to the child's behavior, physical abilities, growth/development, bodily pain/discomfort, temperament and moods, and how well the child gets along with others was given to the parents. Parents were asked to fill the questionnaire on their first visit and after one month either in person for those who returned for the one-month follow-up or over the phone for those who did not return for the one-month follow-up or those who had treatment completed with conscious sedation or under general anesthesia.

## Statistical Analysis

Statistical analysis was performed using SPSS Software version 17.0. (Chicago, SPSS Inc). Wilcoxon Signed Rank Test was used to determine the difference in the mean value of CIS and FIS at the base line and one month follow up. P value <0.05 was considered to be significant.

## Results

A total of 30 individuals were enrolled and completed questionnaires at both time points. Among the 30 participants, 20 were female and 10 were male. The mean age the participants was 34.362+<sub>2.664</sub>. Table 1 shows the Child Impact Score and Family Impact Score. The difference in the baseline mean value and follow up

mean value of CIS and FIS was statistically significant ( $P < 0.0001$ ).

Table 2 shows changes in ECOHIS items and subscales between baseline and after SDF application. The results show that there is a statistically significant difference in the quality of life in terms of improvement in the sleeping, talking and the children has less pain and was less irritable before and after SDF application. Only one parent reported that there was difficulty in sleeping after the SDF application, but it was not statistically significant. 49% percent of the parents reported that there was improvement in the Family Impact Score after SDF application.

**Table 1 - Mean CIS and FIS score at baseline and follow up.**

	<b>BASELINE MEAN, SD</b>	<b>FOLLOW UP MEAN, SD</b>	<b>AVERAGE PAIRED DIFFERENCE,SD</b>	<b>P VALUE</b>
Child Impact Score	5.7, 5.64	0.44, 1.12	5.1, 5.66	<0.0001
Family Impact Score	2.6, 3.56	0.47, 1.23	2.1, 3.74	0.0004

**Table 2 - Changes in ECOHIS Items and Subscales between Baseline and After SDF Application**

<b>CIS</b>	<b>IMPROVED</b>	<b>SAME</b>	<b>WORSE</b>	<b>P VALUE</b>
Missed preschool, daycare or school	13(43%)	17(57%)	0,0	0.0001
Had difficulty eating some food	12(40%)	18(60%)	0,0	0.0005
Been irritable or frustrated	13(43%)	17(57%)	0,0	0.0001
Pain in the teeth, mouth or jaws?	14(40%)	16(53%)	0,0	<0.0001
Had trouble sleeping	13(45%)	16(53%)	1,3%	0.001
Avoided smiling or laughing	9(47%)	21(70%)	0,0	0.0391
Avoided talking	10(33%)	20(67%)	0,0	0.002
Had difficulty drinking hot or cold beverages	13(43%)	17(57%)	0,0	0.0045
Had difficulty pronouncing any words.	16(53%)	14(47%)	0,0	<0.0001
<b>Total CIS Score</b>	<b>20(73%)</b>	<b>9(24%)</b>	<b>1,3%</b>	<b>&lt;0.0001</b>

<b>Financial Impact on family from child's dental problems or treatments</b>	<b>11(37%)</b>	<b>18(60%)</b>	<b>1, 3%</b>	<b>0.0244</b>
<b>Felt guilty</b>	12(40%)	16(53%)	2(7%)	0.0085
<b>Been upset</b>	12(40%)	16(53%)	2(7%)	0.0256
<b>Taken time off from work</b>	0(0%)	30(100%)	0(0%)	0.0001
<b>Total FIS Score</b>	<b>16, 49%</b>	<b>12, 46%</b>	<b>2, 5%</b>	<b>0.0004</b>

## Discussion

The preschool period is a very crucial period during the development of the child<sup>(13)</sup>. Early Childhood Caries can have serious impacts on children's lives, in terms of physical development, emotional growth; quality of life, and learning at school. Untreated ECC can result in significant destruction of the child's teeth, which in turn affect the child's overall health<sup>(14)</sup>.

The present study is a questionnaire based study where, a parent-filled "The Early Childhood Oral Health Impact Scale (ECOHIS)" questionnaire was used to analyze the association between SDF application and child's Oral Health-Related Quality of Life. The results of the present study showed that there was a statistically significant improvement in the quality of life of children and their families after SDF application.

Acs et al reported that 8.7% of children with ECC had significant decrease in the weight as a result of caries<sup>(15)</sup>. Low et al reported that 43% of children had difficulty in eating<sup>(16)</sup>. Acharya et al reported 29.2% % of children had difficulty in eating. Filstrup et al reported that 53% of children, Low et al reported 35% of children and Acharya et al reported 44% of children presented with difficulty in sleeping<sup>(2)</sup>.

There was decreased pain in the teeth, improved pronunciation of words, fewer missed school days and being less irritable and frustrated. Families of the children with ECC reported less financial impact feeling less guilty than before the treatment. Thus, the results of this study show a strong association between SDF application and quality of life of children with ECC.

ECC is a major health problem in found among children in developing nations, mainly in those living in socially backward communities<sup>(14)</sup>. This could be due to low socioeconomic status, social exclusion, and sociocultural differences in oral health beliefs and practices<sup>(17)</sup>. Treatment with SDF is simple and cost-effective. Therefore, SDF can be used in community based health centers.

Decreased sample size is the major limitation of the present study. Most of the parents were not willing for SDF treatment because of its potential staining and discoloration of the tooth. Also, there could be bias in the responses of parents regarding their child's

symptoms to avoid being perceived as a careless parent. Follow-up questionnaires which were completed over the phone could result in a less accurate response than those completed in person. Further studies with a large sample size and a longer follow up should be considered to support the result of the present study.

## Conclusion

It can be concluded that SDF can improve the oral health related quality of life of children with early childhood caries and hence can be used in community level to arrest dental caries in preschool children.

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**Conflicts of Interest:** Nil

**Ethical Clearance:** Taken from Institutional Review Board, Saveetha Dental College and Hospitals, Chennai, India (IHEC/SDC-PEDO1703/19/023)

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