

Original Article

Parental Acceptance towards Silver Diamine Fluoride Treatment among a Group of Children affected by Early Childhood Caries: A Cross-Sectional Study

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Abstract

Aim: This study aims to evaluate the parental acceptance of Silver Diamine Fluoride (SDF) treatment among a group of children affected by Early Childhood Caries.

Subjects and Methods: Three hundred and twenty parents were interviewed for a questionnaire to evaluate their acceptance of SDF treatment for their children regarding anterior and posterior teeth after showing them photos for cases treated with SDF before and after its application.

Results: 200 mothers and 120 fathers were asked for their opinions about the acceptance of SDF treatment for anterior and posterior teeth. Most participants rejected the treatment on account of the SDF staining effect. There was a significant difference regarding the educational level of parents with p value ($p < 0.001$), with a high percentage choosing score (0) strongly refuse and a score (1) refuse treatment with low and moderate levels of education. According to child age, high percentages of parents accepted treatment for young age children below 2 years rather than exposing them to other invasive treatments, including general anesthesia ($p < 0.001$). In extreme cases where children were medically compromised, parents accepted SDF treatment for anterior teeth 78.3% and for posterior teeth 91.8% with significant difference ($p < 0.001$). More parents accepted the SDF staining effect for posterior teeth than anterior teeth.

Conclusions: Most of the parents declined SDF treatment for their children. There was a difference in the level of acceptance of treatment according to teeth location, either anterior or posterior. Educational level, age of the child, and medical status of the child significantly affected parents' acceptance of such treatment.

Keywords: Silver Diamine Fluoride, acceptance, parental, Early Childhood Caries.

I. INTRODUCTION

A Dental caries is among the prevalent infectious diseases that affects adults and children through all life periods. It refers to the specific harm to susceptible dental hard tissues

caused by acidic by products resulting from the bacterial breakdown of dietary carbohydrates (Magno *et al.*, 2019). The child experienced detrimental consequences attributed to dental caries, including eating difficulties, disrupted sleep, headaches, and

avoidance of smiling due to aesthetic concerns (Quritum *et al.*, 2019).

Early Childhood Caries (ECC), recognized by the American Dental Association as a notable public health concern, is characterized by the occurrence of one or more decayed, missing, or filled tooth surfaces (dmfs) in the primary teeth of a child in the pre-school age group (Duangthip *et al.*, 2018). ECC is triggered by inadequate removal of dental plaque and consumption of sugary foods and beverages. These factors alter the metabolism of the dental plaque microbiota, primarily producing lactic acids that lead to enamel demineralization (Twetman and Keller, 2016). Several dental interventions may be required to address the damage resulting from ECC, including pulp therapy, crowns, composite build up, and even extraction (Jiang *et al.*, 2019).

Children exhibiting signs of caries or displaying risk factors for caries should receive suitable anticipatory guidance and be referred for dental care. These findings clearly suggest that parents or caregivers are of prime importance for their children's oral health, developing excellent oral health habits and accompanying them to early dentist checkups (Gavic *et al.*, 2018).

Two primary approaches were employed for managing dental caries: treatment involving drilling and filling, which posed challenges, particularly when dealing with children who displayed limited cooperation. Prevention emerges as the second and highly effective strategy, centering on early-stage intervention to stop the progression of caries formation. Silver Diamine Fluoride (SDF) is among the newly released preventive interventions for dental caries (Alshammari *et al.*, 2019). SDF is a clear alkaline solution that blends the silver antibacterial potentialities with the fluoride remineralizing properties. It is a potentially effective treatment for treating caries lesions and treatment of dentin sensitive

surfaces in young children. It was recommended for children with special healthcare needs that have started in the United State and become available in many countries (Crystal and Niederman, 2019).

SDF was approved as dentinal sensitivity treatment by the US Food and Drug Administration in 2014. It is a cost-efficient, easy-to-use, and minimally invasive product. In situations where surgical intervention for decay is not feasible, it has been employed as a non-surgical approach for managing caries. In pediatric patients who exhibit limited cooperation, SDF can serve as a preventive measure or delay the need for dental treatment until the child becomes more amenable (Alshammari *et al.*, 2019).

One of the most important advantages of SDF is that it could be used easily for uncooperative children and medically compromised patients. Nevertheless, the clinical utility of SDF is constrained by the occurrence of dark discoloration within the tooth structure resulting from silver deposition, potentially resulting in aesthetic apprehensions. This could have an impact on parental willingness to accept the treatment and might lead to a transition towards an alternative treatment option that is aesthetically acceptable (Sabbagh *et al.*, 2020). This study aimed to evaluate parental acceptance for SDF treatment using a questionnaire. The results of such evaluation may have a significant influence on the future choice of such treatment in the management of dental caries.

II. SUBJECTS AND METHODS

Study design:

This is a cross sectional study conducted in the outpatient diagnostic clinics of the Pediatric Dentistry Department in the Faculty of Dentistry, Cairo University, Egypt. The research proposal was reviewed and approved by the Research Ethics Committees (REC)

Faculty of Dentistry, Cairo University, Egypt, with approval number 16-4-20. This investigation was registered on clinical trials.gov with a register number NCT04218955.

Sample calculation:

A power analysis was conducted to ensure sufficient statistical power for the implementation of a 2-sided test of the research question that dentinal staining of SDF influences SDF parental acceptance. Based on the results of **Crystal et al.** (Crystal *et al.*, 2017) in which the prevalence of parental acceptance was (29.66%) within a 95% confidence interval and a 5% margin of error, accounting for finite population correction, the projected sample size (n) was estimated to be 320 cases. The calculation for sample size was executed utilizing Epi info for Windows version 7.2 (Faul *et al.*, 2007).

Methods of data collection:

The current study enrolled 340 parents who expressed their willingness to partake in the study; 20 parents who refused to complete the questionnaire were excluded, while 320 completed it. The inclusion criteria involved parents who were seeking dental treatment for their children with early childhood caries and children with an age range from (1-4) years. Uncooperative parents or children were excluded. Patients were carefully examined for eligibility to participate in the study. Informed consent was approved by the Research Ethics Committee, Faculty of Dentistry, Cairo University, Egypt, and written approval of children's caregivers were obtained before starting the questionnaire and after clarifying the study aims in details. A questionnaire was given to the parents after explaining benefits, drawbacks, indications and contraindications associated with the use of SDF, along with showing them preoperative and postoperative photographs of posterior and anterior teeth that had undergone SDF treatment.

The questionnaire comprised two parts, as illustrated in **Figure 1**. The first part was to collect general information (demographic data), whether they were primary caregiver or not, their relationship to child, age and gender of the child that may influence the acceptance of the treatment, medical status of the child which also could affect the choice of the treatment, age and gender of the parents their occupation, educational level and economic state. Second part included multiple choice questions to assess parental acceptance of SDF treatment in anterior and posterior teeth and was collected using a five end point Likert scale score ranging (0-4).

Statistical analysis

The chi-square test was used to analyze categorical data, which was expressed as frequency (n) and percentage (%). The normality of numerical data was investigated by inspecting the data distribution, computing the mean and median values, and employing the Kolmogorov-Smirnov and Shapiro-Wilk tests. If the data was judged to be normal, it was presented as mean and standard deviation values, and statistical analysis was performed using the independent t-test. If the normality assumption was broken, the data was given as median and range values, and statistical analysis was performed using the Mann Whitney U test. For all tests, the significance threshold was set at $p < 0.05$. IBM® SPSS® Statistics Version 26 for Windows was used for statistical analysis.

III. RESULTS

A notably higher percentage of caregivers were mothers (62.5%), above 30 years old (58.4%), had moderate education (62.5%) and a low economic state (61.6%) ($p < 0.001$), as presented in **Table (1)**. According to **Table (2)**, a notably higher percentage of children were >2 years old (80.3%), females (59.1%), and were free from any systemic diseases (97.5%) ($p < 0.05$).

Concerning the parental acceptance in

anterior teeth, **Figure (2)** showed that there was a significant difference between the scores of various parents concerning the medical state of the child ($p<0.001$), with a higher percentage of parents choosing scores (0) (Strongly refuse) and (1) (Refuse) having medically free children, while a higher percentage of parents choosing score (3) (Accept) with medically compromised children. Also, there was a significant difference between the scores of various parents concerning their educational level ($p<0.001$), with a higher percentage of parents choosing scores (0) (Strongly refuse) and (1) (Refuse), having moderate education, while the majority who chose (3) (Accept) had high education.

In regard to child age, there was a significant difference between the scores of different parents ($p<0.001$), with a higher percentage of parents choosing scores (0) (Strongly refuse), (1) (Refuse) and (3) (Accept) having children who were above 2 years old. In contrast, other parameters like primary care givers, parent age, child gender, and economic states were statistically non-significant. Frequency and percentage values for parental acceptance scores in anterior teeth were also demonstrated in **Figure (2)**.

While regarding the parental acceptance of posterior teeth, there was a significant difference between the scores of different parents regarding the medical state of the child ($p<0.001$), with a higher percentage of parents choosing (0) (Strongly refuse) and (1) (Refuse)

having children who were medically free while accept treatment choosing score (3) for medically compromised children, as demonstrated in **Figure (3)**. Additionally, there was a significant difference between the scores of different parents regarding their gender ($p<0.001$), with a higher percentage of mothers choosing scores (0) (Strongly refuse) and (1) (Refuse), and a higher percentage of fathers choosing score (3) (Accept).

Besides, a significant difference was noted between the scores of different parents regarding their educational level ($p<0.001$), with a higher percentage of parents choosing (0) (Strongly refuse), (1) (Refuse), and (3) (Accept) having moderate education. Furthermore, there was a significant difference between the scores of different parents regarding child age ($p=0.015$), with a higher percentage of parents choosing (0) (Strongly refuse), (1) (Refuse), and (3) (Accept) having children who were above 2 years old.

Concerning the child gender, there was a significant difference between the scores of different parents ($p=0.003$), with a higher percentage of parents choosing scores (0) (Strongly refuse) and (1) (Refuse) having female children, and a higher percentage of parents choosing (3) (Accept) having male children. However, the two variables; parent age and economic states were statistically non-significant, as illustrated in **Figure (3)**.

Table (1): Parents' demographic data

Parameter		N	%	p-value
Primary caregiver	Mother	200	62.5%	<0.001*
	Father	120	37.5%	
Parent age	30 or younger	133	41.6%	0.003*
	Above 30	187	58.4%	
Educational level	High	50	15.6%	<0.001*
	Moderate	200	62.5%	
	Low	70	21.9%	
Economic state	High	0	0%	<0.001*
	Moderate	123	38.4%	
	Low	197	61.6%	

Values with different superscript letters are significantly different *; significant ($p \leq 0.05$) ns; non-significant ($p > 0.05$)

Table (2): Children demographic data

Parameter		N	%	p-value
Child age	2 or younger	63	19.7%	<0.001*
	Above 2	257	80.3%	
Child gender	Male	131	40.9%	0.001*
	Female	189	59.1%	
Medical state of the child	Free	306	97.5%	<0.001*
	Compromised	8	2.5%	

A) General information:

- Are you a primary caregiver?
 - Yes.
 - No.

- Relation to the child?
 - Mother.
 - Father.
 - Other Caregiver.

- Your age:

- Sex:
 - Male.
 - Female.

- Your occupation:

- Educational level :
 - High level (University graduate).
 - Moderate level (High school).
 - Low level (Illiterate).

- Child age:

- Child gender :
 - Male.
 - Female.

- Economic state of the parents:
 - High income level.
 - Moderate income level.
 - Low income level.

- Medical state of the child:

- Medically free.
- Medically compromised.
- Type of the illness:

B) Acceptance of the treatment:

- What is your opinion about silver Diamine fluoride treatment in the anterior teeth?

- Strongly Accept.
- Accept.
- Neutral.
- Refuse.
- Strongly Refuse.

- What is your opinion about silver Diamine fluoride treatment in the posterior teeth?

- Strongly Accept.
- Accept.
- Neutral.
- Refuse.
- Strongly Refuse.

Figure (1): Questionnaire form.

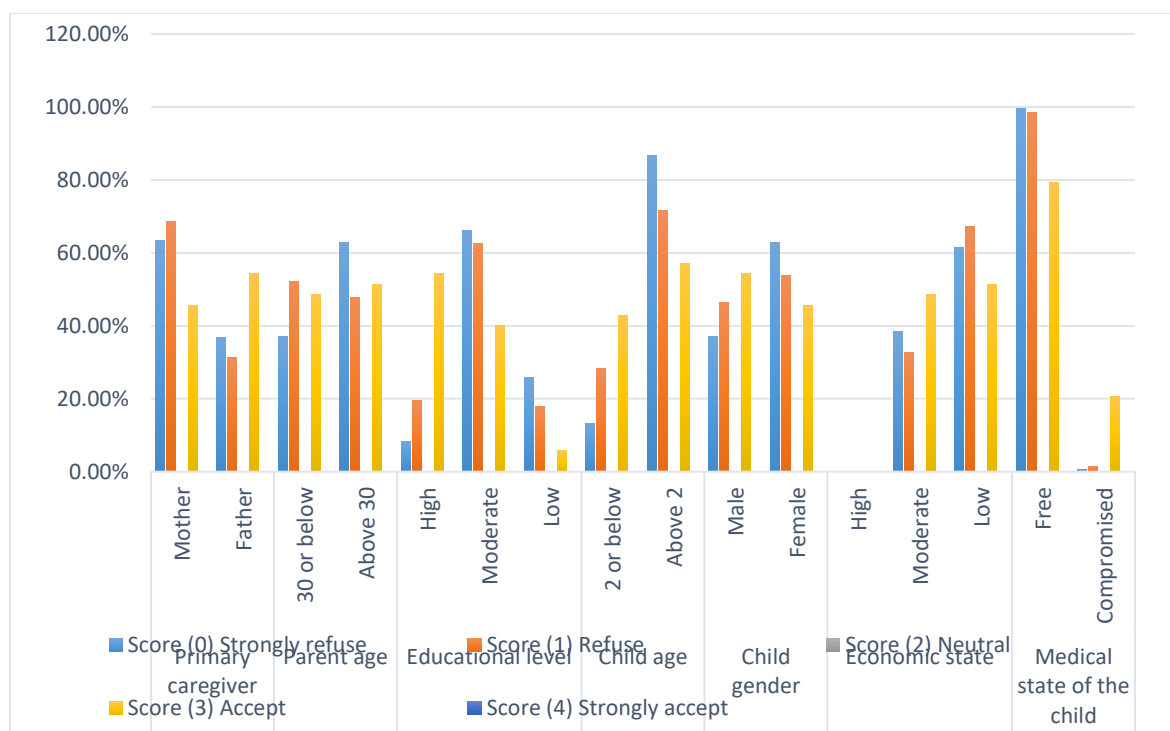


Figure (2): Bar chart showing parental acceptance in anterior teeth

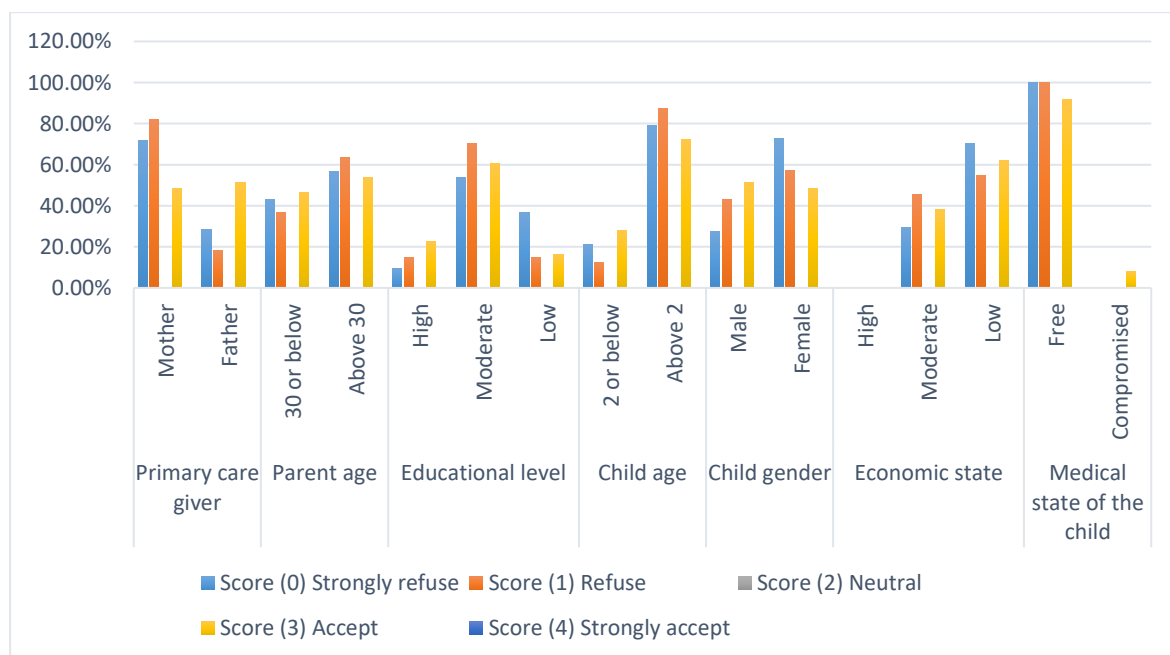


Figure (3): Bar chart showing parental acceptance in posterior teeth

IV. DISCUSSION

Silver Diamine Flouride (SDF) is among the essential products with many advantages, such as being easily applied, non-invasive, and inexpensive, with the only drawback of making black staining on the applied tooth part. Patient satisfaction regarding the treatment is an important factor in choosing the available treatment options. Nowadays, parents are interested in more esthetic appealing options for their children (Seifo *et al.*, 2020). Acceptance of SDF staining to anterior and posterior teeth was assessed through the Likert scale, which is considered an easy and uncomplicated scale to detect the level of acceptance toward SDF treatment; this is reinforced by many other studies as outlined by Alshammari *et al.*, (2019) and Wajahat *et al.*, (2022). Scale scoring was done by the operator then all data were analyzed by the statistician who was blinded to the interview to avoid any bias in the results.

In our investigation, a higher percentage were mothers (62.5%), and less were fathers (37.5%). For the acceptance of SDF treatment in anterior teeth, a high percentage of mothers selected score (0), which strongly refused treatment, while a higher percentage of fathers chose score (3) accepted treatment but with no statistical significance ($p=0.069$). These findings agree with Wajahat *et al.*, (2022), who reported that a high percentage of mothers participated in their study but fathers were more aware about acceptance of treatment. This could be explained by the fact that women are in need of more esthetic treatment than men and that mothers can take the decision about the treatment of their children the same as fathers.

In this study, the age of enrolled children ranged from 1-4 years as the study was carried on preschool children having early childhood caries, and children were divided into two groups; below 2 years 63 (19.7%) children and above 2 years 257 (80.3%) children, this was in harmony with other studies that have been conducted with the same age range Clemens *et al.*, (2018) and ElGhandour *et al.*, (2021). Alternatively, Almarwan *et al.*, (2021) accomplished a study with ages ranging between 5 to 8 years aimed to detect the SDF acceptance in both primary and permanent teeth.

Parents enrolled in the study were allocated into two age groups below 30 years and above 30 years, with results showing that a high percentage of participants was seen in the above 30 years group (58.4%), while a lower percentage was in below 30 years group (41.6%), most of parents in both groups rejected SDF treatment for anterior and posterior teeth. This comes in contrast with the study conducted by Alshammari *et al.*, (2019), who divided the age of parents into 4 different age groups (20-30), (31-40), (41-50) and (above 50) years, with most age groups participated in the study was (31-40) years. Moreover, this group showed a statistical significant difference to reject SDF treatment for anterior and posterior teeth, the same as the study done by Wajahat *et al.*, (2022), who explained that parent's age was divided into 3 groups (20- 30), (31-40) and (more than 40) and reported that middle age group was more aware about SDF and its acceptability.

Our study presented a substantial relation between acceptance of SDF and parental educational level. Parents were divided into three levels according to

educational level: high level (15.6%), moderate level (62.5%) and low level (21.9%). The results showed that a high percentage of high-educational level parents chose score (3) accept the treatment while moderate and low level chose score (0) strongly refuse and score (1) refuse the treatment for anterior and posterior teeth.

This could be explained that as parents' educational level increases, parents are more aware about less invasive treatments like SDF rather than exposing their children to invasive treatment under general anesthesia. This was in agreement with Crystal *et al.*, (2017), who found a relation between acceptance of SDF and degree of education, parents graduated from university and high school accepted SDF for anterior and posterior teeth, while a study done by Bassam *et al.*, (2022) reported that there was no correlation between educational level of parents and acceptance of the treatment.

In this study, there was a relation between parent's income and their acceptance of SDF treatment. Parent's economic status was divided into three groups according to the parent's monthly salary to detect if the cost could affect the selection of treatment options. The results showed that there were no high-income parents reported in this study, moderate income parents were 123(38.4%), and the majority of parents were of low income 197 (61.6%).

Acceptability was not significant between both groups in anterior or posterior teeth ($p=0.055$) as these groups were aware about other treatment options that were introduced in primary health care. Governmental hospitals and

educational hospitals give another esthetic treatment options. This comes in agreement with Alshammari *et al.*, (2019), who supported the same results regarding parental income, while in contrast with a study done by Bagher *et al.*, (2019), who reported parental acceptance for utilizing SDF on child's primary and permanent teeth and found that parents of high income preferred esthetic treatment options over low income parents.

Another important factor that affects acceptance of treatment in this study was the medical status of the child. This study reported a high percentage of medically free children 306 children (97.5%), and only 2.5% children medically compromised with autism and heart diseases. Parents with medically free children chose score (0) (99.5%) strongly refuse treatment, score (1) (98.5%) refuse, and score (3) (79.3%) accept treatment for anterior teeth, while in medically compromised children, 8 of 8 accept SDF for posterior teeth (100%) and 75% accept it for anterior teeth. This aligns with Almarwan *et al.*, (2021), who reported parental acceptance of SDF on special health care needs children and explained that parents of special health care needs children accept SDF application rather than exposing their children to any painful treatment or general anesthesia.

Additionally, Hu *et al.*, (2020) conducted a study to detect parental acceptance of SDF in children with autistic disorders and found that parents of children with autism or neurotypical disorders accept SDF application as alternative treatments, namely general anesthesia. In this study there was a relation between tooth locations, whether anterior or posterior, and parental

acceptance of SDF application. The results showed that 97 parents (30%) accepted the application of SDF on posterior teeth, while 35 parents (10%) accepted the application on anterior teeth. This aligns with the study done by Alshammari *et al.*, (2019), where parents strongly refuse SDF treatment for anterior teeth rather than posterior teeth as they knew that the presence of staining in the posterior segment would be less visible than anterior ones. Parents always demand that their children have the best esthetic appearance.

Study Limitations

The current research comprises few limitations like:

- 1) Photos of cases prior to and following the SDF application were shown to parents, and none of the children received SDF treatment.
- 2) High socioeconomic income parent's participants group were absent in the study, which may have affected treatment acceptance.

V. CONCLUSION

In the light of our findings, it could be concluded that:

- 1) SDF could be accepted as a treatment option by parents according to many factors like parent's educational level, age, and medical status of the child and according to teeth location.
- 2) Educational level of parents affected treatment acceptance; parents with high educational levels had more acceptance of the treatment.
- 3) Parents with children younger than 2 years preferred treatment with SDF rather than exposing their children to more invasive treatment options.
- 4) Parents whose children were medically compromised accepted SDF treatment rather than any other options.

- 5) The parent's acceptance was dependent on the location of the teeth, where acceptance was evident more in cases of posterior teeth than in anterior teeth.

Conflict of Interest:

The authors declare no conflict of interest.

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Ethics:

This study protocol was approved by the ethical committee of the faculty of dentistry-Cairo university on: 30/4/2020, approval number: 16420.

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