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Research Article

Parental Perceptions and Acceptance of Silver Diamine Fluoride Treatment in Al-Madinah Al-Munawarah, Saudi Arabia

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Abstract

Background: The use of 38% Silver diamine fluoride (SDF) has been proven to be an alternative treatment for caries prevention and arrest. The SDF has drawbacks. The most common drawback of SDF is visible dark staining which could affect the parental acceptance of the utilization of SDF on their children.

Objective: To evaluate parent's acceptance to SDF treatment and to determine the factors that influence their decision.

Methods: A cross-sectional descriptive observational study was conducted on 233 parents in Al-Madinah Al-Munawarah, Saudi Arabia between October 2020 and November 2020. Data obtained through a web-based survey. The survey included questions about demographic data of the participants, background information about their children, and parental acceptance towards silver diamine fluoride treatment on their children under different child behavioural statues (Cooperative, Upset, Crying, Screaming, and needing general anaesthesia).

Results: Overall, 116 of 233 (49.8%) of parent reported that SDF as acceptable/totally acceptable in anterior teeth if their child assumed cooperative during dental restoration while it was 76.9% for posterior teeth in a cooperative child. Parental acceptance increased when child assumed having behavioral barrier reaching highest acceptance when child assumed needing general anaesthesia (74.7% for anterior, 82% for posterior teeth) with significant higher acceptance for posterior teeth under all behavioral conditions (Wilcoxon Signed Rank test). Interestingly only 60% of parents had same acceptance rating for both anterior and posterior teeth if child assumed cooperative, which increased to 86.3% in case child need general anaesthesia. Parental acceptance in anterior teeth were influenced by parental education level, child carious experience and child behavior during previous dental restoration. On the other hand, parent/caregiver age, family income and child's gender did not influence either acceptability rating.

Conclusion: Parental acceptance of SDF treatment is higher for posterior teeth than for anterior teeth. Parent are more likely to accept SDF for anterior and for posterior teeth if their child experienced difficulties during restorative work especially to avoid treatment under GA.

Keywords: *Acceptance; Silver Diamine Fluoride; Caries; Prevention; Silver Diamine Fluoride*

Introduction

Dental caries is one of the most common cause of extraction of primary teeth in Saudi Arabia [1]. A decline in the prevalence and the severity of dental caries is particularly observed in countries having established public health programmes using fluoride for dental caries prevention, coupled with changing living conditions, healthier lifestyles, and improved self-care practices [2]. Optimal exposure to

fluoride is important in limiting disease progression as fluoride promotes remineralisation [3]. However, there are many barriers affect the children dental care such dental fear, financial limitation and scheduling difficulties and transportation issues [4].

The use of 38% Silver diamine fluoride (SDF) has proven to be an alternative treatment for caries prevention and arrest which is painless, safe, inexpensive and less invasive procedure [5]. In 2014, the Food and Drug Administration (FDA) approved the use of SDF in the U.S. as a "device" to treat tooth hypersensitivity, which is a similar regulatory pathway to the clearance of fluoride varnish [6]. SDF has been suggested for difficult-to-treat lesions and patients with high caries risk, Suitable to treating caries in apprehensive young children who may have intense dental fear, uncooperative patients with special needs and those who require multiple treatment visits, or those without access to dental care [7]. Unfortunately, The SDF has drawbacks. the most drawback of SDF is visible dark staining which could affect the parental acceptance of the utilization of SDF on their children [8].

There are some studies that focus on the parental acceptance of the utilization of SDF on their children. A study In New York University Pediatric Dentistry Clinic and at several private clinics in New Jersey In 2017 reported that Most parents (67.5%) judged SDF staining on the posterior teeth to be esthetically tolerable, but only 29.7% of parents made this same judgment about anterior teeth [9].

Another study In King Abdulaziz University Faculty of Dentistry in Jeddah, Saudi Arabia in 2017 reported that the mean parental rating of treatment acceptability of the staining associated with SDF was 3.9 ± 1.95. The plurality considered the staining caused by SDF treatment strongly not acceptable (43.4%) [10,11].

In a systematic review and meta-analysis study was conducted in 2020 reported that eight studies fulfilled the inclusion criteria. There were statistically significant differences between parental acceptance for SDF usage on posterior teeth compared to anterior teeth ($P < 0.001$, OR: 0.23 and 95% CI: 0.15 - 0.34) and for SDF usage on anterior teeth of uncooperative compared to cooperative children ($P < 0.001$, OR: 0.27 and 95% CI: 0.17 - 0.44). Additionally, parent's acceptance rate for SDF application increased after follow-up visits and education [8].

To our knowledge, there are no previously published study in the literature that measured parental acceptance about utilization of SDF on their children's in Madinah, Saudi Arabia. The aim of the study is to evaluate parent's acceptance to SDF treatment and to determine the factors that influence their decision-making.

Materials and Methods

Study design, participants and setting

A cross-sectional descriptive observational study conducted in Al Madinah Al Munawwarah, Saudi Arabia between October 2020 and November 2020. Data obtained through Anonymous self-administered questionnaire created by a web-based survey. Inclusion criteria include Parents who live in Al Madinah Al Munawwarah, Saudi Arabia, and have accessibility to the website and agree to participate in the study. Exclusion criteria: not living in Al Madinah Al Munawwarah, not being a parent and have no accessibility to the website. Total sample size of at least 199 was calculated using G*Power 3.1.9.7 based on assumption small effect size= 0.2, significance level (α)= 0.05 and power = 0.8 with Priori analysis for 2 dependent matched groups (acceptance of SDF for Anterior vs Posterior primary teeth).

Measurements and data collection

Data obtained through Anonymous self-administered the questionnaire created by a web-based survey. The questionnaire includes an introductory page. A confirmation statement will be included to ensure that all the information given will remain anonymous, and participation to complete the questionnaire is voluntary. The questionnaire was written in Arabic language, and it encompasses three sections as follow:

- **Section one:** Contains demographic data of the participants such as nationality, age, gender, socio-economic status, and education level.
- **Section two:** Questions about the child such as gender, caries experience, and cooperation level.
- **Section three:** Questions about parental acceptance towards silver diamine fluoride treatment on their children. Including introduction about SDF and its advantages and disadvantages, as well as pictures, show pre-and post-operative anterior and posterior teeth treated by SDF. Then, the participating parent was asked to rate the treatment acceptability regarding the staining and child cooperation and rank their acceptance as 4=strongly acceptable, 3=acceptable, 2=not acceptable, and 1=strongly not acceptable.

Starting with the children cooperation as following: cooperative, upset, crying, screaming and the need for general anaesthesia (GA). In all these scenarios, we asked parents to answer separate questions about anterior and posterior teeth.

Ethics approval

This study was approved by Taibah University College of Dentistry Research Ethics Committee (Ref:TUCDREC/28092020/MMAli). The study adhered to the World Medical Association of Helsinki, i.e. participation was voluntary, confidentiality was assured, and the questionnaire was anonymous and coded. However, responding to and returning the survey questionnaire implied consent.

Data analysis

Data were collected, coded, and analyzed using the SPSS software, the data described using measures of central tendency and measures of dispersion by the Mann Whitney, Kruskal Wallis, and Chi-square, the significance level is 0.05.

Results

As shown in table 1, 233 parents completed the survey and provided their demographic information. Of the 233 participants, 59 (25.3%) were fathers and 138 (59.2%) were mothers and 36 (15.5%) were a caregiver. The great majority of the participants were in the age range of 31 to 40 years representing 88 (37.8%), followed by age ranges of 20 to 30 years (28.8%) as indicated in table 1. Around three-quarters of the sample had education at the level of bachelor's degree or higher.

Variable	NO. (%)
Identity*	
Father	59 (25.3%)
Mother	138 (59.2%)
Care giver	36 (15.5%)
Age*	
20 to 30y	67 (28.8%)
31 to 40y	88 (37.8%)
41 to 50y	60 (25.8%)
More than 50y	18 (7.7%)
Level of Education*	
High school or less	30 (12.9%)
Diploma	25 (10.7%)
University	165 (70.8%)
Postgraduate studies	13 (5.6%)
Family Income*	
From 3000 to less than 6000 SAR	60 (25.8%)
From 6000 to less than 9000 SAR	50 (21.5%)

From 9000 to less than 12000 SAR	52 (22.3%)
More than 12000 SAR	71 (30.5%)
Child caries experience*	
Yes	196 (84.1%)
No	35 (15.0%)
I don't know	2 (0.9%)
Child's cooperation*	
Cooperative	59 (25.3%)
Upset but he/she accept treatment	83 (35.6%)
Cried	19 (8.2%)
screamed	3 (1.3%)
Uncooperative and the doctor unable treat him/her in dental chair	12 (5.2%)
He/she didn't do restoration before	57 (24.5%)

Table 1: *Demographic Characteristics of Parents Responding to the Survey (N =233).*

When asked about their child's caries experience, 84% of the children have dental caries. In addition, when asked about their child's behavior, 25.3% of parents reported that their child was cooperative during restorative treatment, whereas 45.1% reported that their child had experienced some level of difficulty (the child was upset, cried, and screamed) and 5.2% were uncooperative and could not be treated and 24.5% didn't receive a restorative treatment before.

When asked about their acceptance of SDF use if child assumed cooperative in posterior teeth 76.9% reported as accept or totally accept compared to only 49.8% in anterior teeth (Table 2). In case of child needing GA, the acceptance (accept or totally accept) increased to 82% in posterior teeth, while for anterior teeth it was 74.7%.

	Mean (SD) n (%)	**Totally Unacceptable n (%)**	**Unacceptable n (%)**	**Acceptable n (%)**	**Totally Acceptable n (%)**
Cooperative					
Anterior	2.47 (0.98)	44 (18.9%)	73 (31.3%)	78 (33.5%)	38 (16.3%)
Posterior	2.98 (0.8)	11 (4.7%)	43 (18.5)	119 (51.1%)	60 (25.8%)
Upset					
Anterior	2.57	36 (15.5%)	68 (29.2%)	90 (38.6%)	39 (16.7%)
Posterior	2.93	13 (5.6%)	48 (20.6%)	115 (49.4%)	57 (24.5%)
Crying					
Anterior	2.61	32 (13.7%)	67 (28.8%)	94 (40.3%)	40 (17.2%)
Posterior	3.05	7 (3.0%)	35 (15.0%)	131 (56.2%)	60 (25.8%)

Screaming Anterior Posterior	 2.68 3.05	 25 (10.7%) 7 (3.0%)	 74 (31.8%) 40 (17.2%)	 84 (36.1%) 121 (51.9%)	 50 (21.5%) 65 (27.9%)
Need GA Anterior Posterior	 2.87 3.02	 22 (9.4%) 13 (5.6%)	 37 (15.9%) 29 (12.4%)	 123 (52.8%) 132 (56.7%)	 51 (21.9%) 59 (25.3%)

Table 2: *Acceptability Rating Distribution According to Tooth Location and Behavioral Condition.*

Parental acceptance of SDF treatment in anterior teeth was significantly lower than that of posterior teeth, under all behavioral conditions inquired (p=0000, Wilcoxon Signed Ranks Test) (Figure 1).

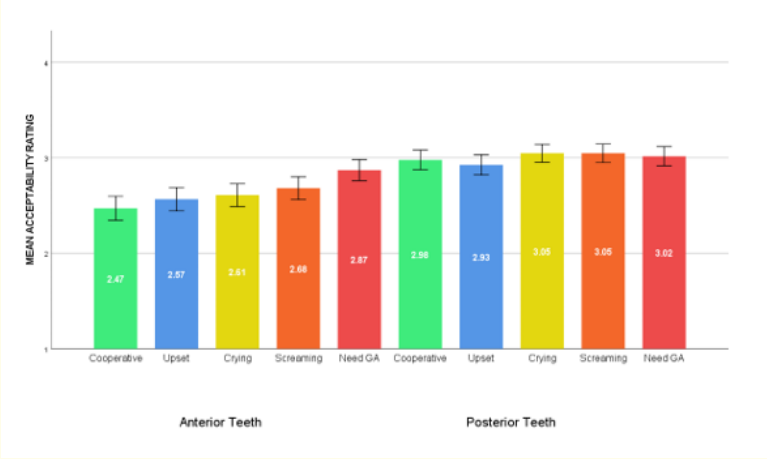

Figure 1: *Acceptance according to behavior and tooth location. In the rating scale, a score of 1 indicated "totally unacceptable" and 4 indicated "totally acceptable." Error bars indicated 95% confidence intervals. GA: General anesthesia.*

The change in acceptance was calculated as Acceptance in Anterior teeth – Acceptance in posterior teeth, This change is represented in table 3, Which shows highest difference in acceptability according to tooth location is when child assumed cooperative, while if the child need GA around 86% of parents will show no difference between anterior and posterior teeth.

Demographic variables: parental gender/caregiver, age, income, and education level, children's past dental experience was analysed for their effect on acceptability on each condition (Kruskal Wallis Test). The parent/caregiver age, family income, and child's gender did not influence either acceptability rating. While parental gender/caregiver had a significant interaction in posterior teeth if the child was upset, crying, or need GA. On the other hand, the education level has a significant effect on acceptability of anterior teeth, if the child assumed cooperative, upset, and crying (Figure 2).

Behavioural Status	Mean (SD)	No Change	Higher Acceptability	Lower Acceptability
Cooperative	.51(.87)	60.1%	3.4%	36.5%
Upset	.36(.86)	69.1%	3.9%	27%
Crying	.44(.77)	68.2%	0.4%	31.4%
Screaming	.37(.71)	69.5%	1.7%	28.8%
Need GA	.15(.54)	86.3%	1.7%	12.1%

Table 3: *Changes in acceptability according to tooth location.*

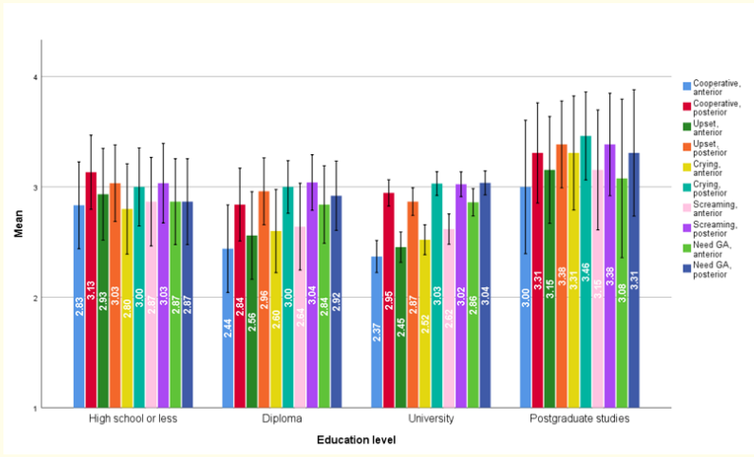

Figure 2: *Acceptance according to tooth location and education level. In the percentage of accept and totally accept is represented. In the rating scale, a score of 1 indicated "totally unacceptable" and 4 indicated "totally acceptable." Error bars indicated 95% confidence intervals. GA: General anesthesia.*

Childs previous experience of dental caries had a significant effect on the acceptability of SDF in anterior teeth if the child assumed cooperative (mean = 2.5 for children with caries experience vs 2.14 for caries free children). The child reported cooperation level experience during restoration (sample=176 excluding those who reported no history of dental restoration) influenced anterior teeth acceptance if the child assumed screaming or needing GA (Figure 3).

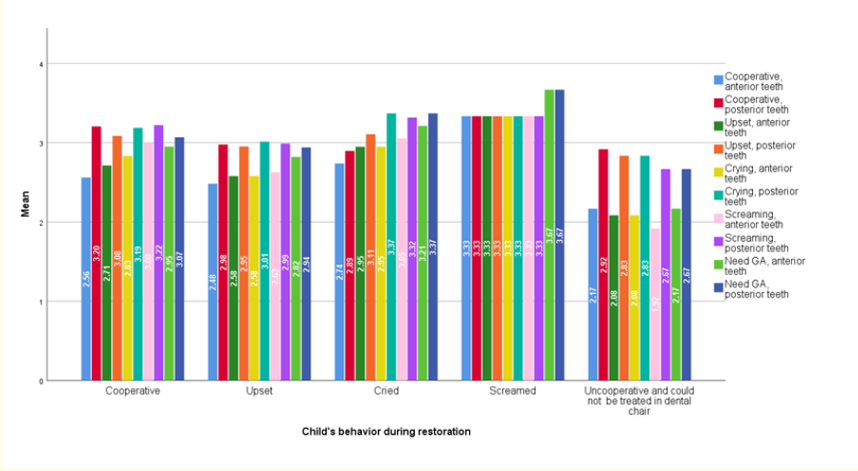

Figure 3: *Acceptance according to tooth location and previous cooperation level during restoration. In the rating scale, a score of 1 indicated "totally unacceptable" and 4 indicated "totally acceptable." Error bars indicated 95% confidence intervals. GA: General anesthesia.*

Discussion

This is the first study to investigate the parental acceptance of the utilization of SDF on their child's teeth and to examine the factors that influence their decision in Al-Madinah Al-Munawwarah, Saudi Arabia.

The results support the following major findings, acceptance of SDF staining was greater for posterior teeth than for anterior teeth. Acceptance level increased as the child becomes more uncooperative and required advanced behavioral management approaches. This finding is supported by a recent systematic review by Sabbagh., *et al.* (2020), in their study they concluded that SDF acceptance influenced by tooth location and cooperation level of the child with significantly higher acceptance in posterior teeth and in an uncooperative child.

Among the demographic factors investigated, we found few that significantly affected the acceptability of SDF. Surprisingly, the carious experience affected the acceptance of SDF, parents with children who had carious experience reported significantly higher acceptance for anterior teeth, only if the child assumed cooperative. It could be presumed that familiarity with dental caries could be a confounding factor in the acceptance of SDF in anterior teeth.

Moreover, in our analysis, we found that the educational level has a significant impact on the acceptabilityof SDF treatment for anterior teeth when a child assumed cooperative or upset or crying. Parents with a bachelor's degree reported the lowest acceptance followed by diploma then the high school or less suggesting that aesthetic concern might be related to education level or parent. This relation is supported by Crystal., *et al.* (2017), who reported that higher mean acceptability rating in parents with an education level of high school or less. Such relationship in this study was not observed by Bagher., *et al.* (2019) who found no significant relationship between education level and level of acceptance.

Acceptability increases with presence of behavioural conditions with highest in case child needed GA, with higher difference between anterior and posterior teeth if child assumed cooperative. Such difference in acceptance between anterior and posterior teeth decrease with increasing difficulty of behavioural condition. This may reflect that although aesthetic component plays clear role in the decision making. Parents are willing to compromise aesthetic component if their child assumed to have behavioural challenges during treatment or to avoid need to be treated under GA.

The decision process regarding treatment utilizing SDF is an individual complex process. Factors as tooth location, education level, and child`s cooperation level might affect this process. Although confounding factors other than those investigated in the study might influence the decision-making process.

In the clinical settings, dentists are advised to utilize a proper consent before starting SDF procedure, and to provide parent with clear information regarding SDF advantages and disadvantages utilizing appropriate pictures especially in Anterior region to ensure parent understand the expected results.

One of the difficulties faced in this study, that it was an online survey due to the covid-19 pandemic, therefore no further clarification could be provided to parents if they desired more information. But the survey was piloted prior to distribution and no parents had any inquiries. Another limitation was that the study was conducted without an actual experience of SDF treatment but only utilizing photos of before and after SDF application. Lastly, a convenience sample of population in living in Al-Madinah Al-Munawwarah for the online survey was used, therefore the interpretation of the results should be implemented with caution and not to be generalized over the population.

Conclusion

Parental acceptance of SDF treatment is higher for posterior teeth than for anterior teeth. The results of this study show that parental acceptance of SDF treatment increase in the presence of child behavioral conditions, especially to avoid need for GA. To help parents de-

cided which treatment is acceptable for their children, dentist should utilize a clear informed consent ideally supported with pictures of SDF treatment expected outcomes.

Author Contributions

All authors contributed to the work reported in this paper. This included conception, study design, data collection, acquisition, analysis, and interpreting the results. In addition, the authors contributed to the literature review, drafting, revising, and critically commented on the article. All authors approved the final version submitted for publication, agreed to which journal the article has been submitted to, and agreed on responsibility for all aspects of the work.

Disclosure

The authors declare no conflicts of interest.

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