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Acceptance of Silver Diamine Fluoride to Arrest Early Childhood Caries by Refugee Parents and Caregivers

by

Maysoon Rashid

A thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Science in the Department of Community and Public Health

Idaho State University

Fall 2021

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of Maysoon Rashid find it satisfactory and recommend that it be accepted.

_____

Irene van Woerden, PhD, Chair

_____

Ryan Lindsay, PhD, Second Committee Member

_____

Leciel Bono, RDH-ER, MS, Graduate Faculty Representative

October 21, 2021

Maysoon Rashid
Community and Public Health

RE: Study Number IRB-FY2022-16: Acceptance of Silver Diamine Fluoride to Arrest Early Childhood Caries by Refugee Parents and Caregivers

Dear Maysoon Rashid:

I have reviewed your application for revision of the study listed above. The requested revision involves:
In the initial IRB for the study population and number of subjects "under 12 years old" was stated ("Refugee parents who have children under 12 years old"). This was different to the actual data collection which included refugee parents with 12 year olds (data collection = "12 or under", current IRB = "under 12 years").
The proposed change is for the study population to include refugee parents with children 12 years or under, so that we can include the 12 year olds.

You are granted permission to conduct your study as revised effective immediately. This study is not subject to renewal.

Please note that any further changes to the study must be promptly reported and approved. Contact Tom Bailey (208-828-2179; email humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
Human Subjects Chai

TABLE OF CONTENTS

List of Tables

List of Figures

List of Abbreviations

ECC	Early childhood caries
S-ECE	Severe early childhood caries
SDF	Silver Diamine Fluoride
FDA	Food and Drug Administration

Acceptance of Silver Diamine Fluoride to Arrest Early Childhood Caries by Refugee Parents and Caregivers

Thesis Abstract-Idaho State University (2021)

Introduction: Silver Diamine Fluoride (SDF) is an effective and painless alternative to traditional treatment of caries. However, silver ions in SDF leaves a black stain on the decayed portion of the tooth. This study examined parental perceptions and acceptance of SDF treatment for primary teeth.

Methods: A mixed methods approach was used to understand refugee caregivers' opinions regarding their acceptance of SDF to arrest Early Childhood Caries.

Results: A total of thirty-four refugee parents participated in this study. The majority of participants were unaware of SDF treatment (91.2%). Participants said that they would accept SDF if the dentist recommended it. Factors such as child anxiety, gender, age, parents' acculturation, knowledge of SDF, and highest educational level were not significantly associated with the parents' treatment preference ($P>0.05$).

Conclusion: Most refugee parents were unaware of SDF treatment. When informed, most would agree to treatment, sacrificing aesthetic outcomes for a less invasive procedure.

Keywords: Silver Diamine Fluoride, Early childhood caries, Refugee

Chapter I: Introduction

Dental caries is a very concerning issue for all age groups. Children can be especially affected by dental caries in their early years. For example, dental caries on deciduous teeth may occur as early as 3-6 months after teeth emerge (Stevanović et al., 2021). Early childhood caries (ECC) is defined by the American Academy of Pediatric Dentistry as the presence of one or more decayed demineralized lesion without evidence of cavitation or cavitated lesion, or missing teeth due to caries, or filled tooth surfaces in any primary tooth in children younger than six years (Cianetti et al., 2020). Children under three years may experience severe early childhood caries (S-ECC), which are also called "nursing caries" or "baby bottle decay*"* (Finnegan et al., 2016).

Children's quality of life can be significantly impacted by ECC (Martins-Júnior et al., n.d.; Filstrup, 2003). Moreover, traditional treatment is expensive, particularly if general anesthesia is required which can affect a parent's decision to treat (Cannon, 2007). Refugee children, in particular, lack preventive dental care. Most have never had a toothbrush or toothpaste. Nor have they had access to systemic water fluoridation (Cote et al., 2004).

Most parents are aware of traditional treatment for ECC (e.g., restoration or extraction of primary teeth) but not Silver Diamine Fluoride (SDF) (Kyoon-Achan et al., 2021). In the United States, SDF was approved by the U.S. Food and Drug Administration (FDA) in 2014 (Food and Drug Administration, 2017). The application of SDF for arresting ECC among refugee children is recommended to be considered, as Rajendra (n.d.) states, SDF is an effective, inexpensive, simple and atraumatic procedure.

Silver Diamine Fluoride is a safe treatment for carious lesions as well as a painless alternative to traditional methods of cutting the tooth structure to remove the cavity (drilling)

(Jewell, 2018). Silver Diamine Fluoride can be applied without generating aerosols (Raskin et al, 2021) and without tooth structure removal (Greenwall-Cohen et al., 2020). The silver ions in SDF are an antimicrobial agent that kills bacteria and prevents the formation of new bacterial biofilms on teeth, however they oxidize and leave a black stain on the decayed portion of the tooth. While many studies have shown that the benefits of SDF application in the target population outweigh the risk of stain when compared to more invasive procedures such as surgery (Crystal, 2017; Kumar et al, 2019; Magno, 2019), the esthetic effects of SDF have led to provider concern that parents or caregivers will not accept the treatment (Kerns, 2019).

Interest in the use of SDF has resurfaced for treating populations with a high-risk of dental caries (Patel et al., 2021). Moreover, SDF is a good alternative treatment option to limit the transmission of air-borne pathogens amid the challenging time of the COVID-19 crisis because the application of SDF does not release aerosols (ISAACS, 2021). The dual mechanism action of SDF, from the combination of the antimicrobial effect of silver, promotes remineralization by fluoride. Silver Diamine Fluoride is trauma-free, so it is a good treatment option for children under the age of five years who have only primary teeth (Crystal & Niederman, 2019). In addition, the brand form (Advantage Arrest) of SDF is affordable. An 8 ml bottle of Advantage Arrest costs around $129 and is approximately enough to treat 1600 sites (Chhokar et al., 2017). Notably, intact enamel is not stained by SDF. Thus, only the application site where the caries is located will be affected (Bowen, 2016). Silver Diamine Fluoride could appeal to parents because many parents want to avoid surgical procedures for their children or because some children have behavioral barriers to conventional cavity treatment. However, factors like beliefs and misinformation that exist among the target population can reduce the enthusiasm for SDF. For example, if people receive misinformation from the media or friends,

such as, SDF is toxic and turns all teeth surfaces black, this may result in people avoiding SDF treatment. The use of SDF is effective and is anticipated to result in significant cost savings to Medicaid programs and dental insurance companies.

Research questions/Goals

The purpose of the study is to understand the opinions and barriers of refugee parents and caregivers living in Idaho regarding the application SDF to manage ECC.

1. What is the refugee parent's or caregiver's perception of SDF?
2. What do refugee parents or caregivers think about the efficacy and safety of SDF?
3. What is the opinion of refugee parents or caregivers regarding the application of SDF to their children's primary teeth as opposed to restorative surgery?
4. What factors are associated with refugee parents' willingness to accept SDF treatment for their children?

Significance:

To date there have been no published qualitative studies in the United States investigating refugee parents' opinions regarding the acceptance of SDF to arrest ECC. For this thesis, a mixed methods study will be conducted. The cross-sectional study will examine the factors associated with refugee parents' willingness to accept SDF use for their children. Factors such as child behavior, gender, and health insurance will be considered. This study will provide information which can be used to improve the public health community's ability to reduce oral health disparities and risk of childhood caries in refugee communities. Additionally, increasing awareness about SDF can be a way to reduce a barrier to treatment due to cost, and may have an effect on protecting and improving oral health among the refugee population. This is because parent's perception and acceptance are the main way to support the use of SDF treatment for

primary teeth. Overall, this study aims to examine the current acceptability of SDF among refugee populations and the factors associated with positive or negative opinions of SDF treatment.

Approach/Aim

In this thesis, I plan to interview and study the refugee population in Idaho to establish their knowledge of SDF and its benefits as well as the important of treatment of caries in primary teeth and the effect of such treatment on children's quality of life. I will also address the importance of regular dental care. This study will increase awareness and knowledge of economic and clinical choices made by the refugee population in southwest Idaho. Consequently, it will decrease the prevalence of untreated dental caries among the refugee populations.

Chapter II: Review of Literature

Early Childhood Caries

Early childhood caries is one of the most common chronic diseases affecting children in the United States (Nunn et al., 2009) and worldwide (Anil & Anand, 2017). Early childhood caries is a 100% preventable (Heiser, 2020), but ECC can increase missing school days due to dental pain (Kumar et al, 2019). Martins-Júnior et al., (n.d.) and Filstrup (2003) found ECC significantly associated with high negative impact on the oral health related quality of children's lives. Children's growth is also affected by ECC (Shen et al., n.d.); these researchers found that children with at least one decayed tooth were significantly underweight. This could be due to pain and chewing difficulties. Affected children can also end up hospitalized due to life threatening infections (Colak et al., 2013).

Traditional treatment of ECC is expensive, especially if it requires advanced form of behavior management such as general anesthesia which can be a barrier for treatment due to cost (Cannon, 2007). Burgette and Quiñonez (2018) found that the cost of dental treatment under general anesthesia or conscious sedation increased between 2011 and 2015. The cost was greater for general anesthesia than for conscious sedation due to the rising cost to Medicaid and increasing the need for ECC treatment under general anesthesia. Notably, Sihra, et al. (2020) stated that children who had been treated for ECC under general anesthesia often required additional treatment (relapse rates can range from 22% to 58.5%), which resulted in the necessity for general anesthesia again. This increases the risks and additional costs associated with anesthesia.

Dental caries in young children can result from many different sources, including for example, "breastfeeding, bottle feeding, too frequent intake of saccharose-rich food as well as

the lack of adequate oral hygiene" (Stevanović et al., 2021). In addition, dental caries can result from such things as "dietary habits, the transmission of cariogenic pathological microorganisms" and lack of proper oral hygiene habits resulting from "family values, tradition, and lifestyle" (Stevanović et al., 2021).

There are multiple factors contributing to the high prevalence of ECC among children living in poverty or disadvantaged areas. This could be due to limited funds and limited access to dental care services (Kumar et al, 2019). Other potential risk factors are low educational levels and/or low income of parents (Finnegan et al., 2016). Finnegan et al. also noted that certain races and ethnicities are less likely to be aware of proper oral hygiene. Dental insurance is clearly another factor as children from families without dental insurance have three times the dental issues of those who do (Finnegan et al., 2016). In addition, the COVID-19 pandemic has caused a significant decrease in access to health care for young children, especially children who have limited access to dental facilities (Meyer, & Danesh, 2021).

Oral Health among Refugee Population in the United States

In the U.S. population, over the last twenty years, there has been a significant decrease in the level of dental caries. Unfortunately, this is not true of the less affluent communities, particularly the immigrant and refugee populations (Alrashdi et al., 2021). In the United States, immigrant children tend to have a significantly larger number of carious lesions compared with U.S.-born children, and they have twice the prevalence of ECC. Refugee children have the greatest number of untreated caries (around 75%) (Reza et al., 2016). Cote et al. (2004) found significant differences between refugee children and U.S. children in "treatment urgency, untreated caries, extent of dental caries, and presence of oral pain".

Most first world countries accept refugees, helping them move from troubled to safe countries. The United States takes more refugees than other first world countries. In the United States there were more than 44.9 million immigrants in 2019; immigrants make up 13.7% of the U.S. population (Batalova et al., 2021). Approximately ten percent of these immigrants are refugees. Even though the number of refugees living in the United States is less than the number of immigrants, refugees may have more health issues due to more difficult circumstances than people who immigrate voluntarily (Ijaz et al., 2021). Some possible reasons for this are different diet, cultural beliefs, and sugary foods/drinks consumed while living in refugee camps (Crespo, 2019).

Oral health is a primary need for refugee children. However, most refugee children have never received preventive dental care nor even a toothbrush, toothpaste or systemic water fluoridation (Cote et al., 2004). Therefore, the children of recently settled refugees to the United States are at high risk of developing ECC. Reza et al. (2016) found that the oral health of children of refugees who have been in the United States for a while is better than the oral health of the children of more recent refugees. Most of the recent refugee population have faced many barriers, such as language limitation, dealing with cultural differences, insufficient dental insurance coverage, and financial struggles, all of which have resulted in limiting their access to dental care.

The preponderance of refugee children living in the United States are from “Africa, Eastern Europe, the Middle East, and Asia” (Cote et al., 2004). Cote et al. noted that caries risk in refugee children also varies by region of origin, with the highest risk among children from Eastern European 79.7% and the lowest risk among children from Africa 38%. Even though children of African refugees were less likely to be seen by a dentist, their caries experience and

untreated caries were significantly less than that of children of Eastern European refugees. The possible reason for this finding may be different exposure to public or school water fluoridation, dietary preference, lack of access to dental care and specific cultural beliefs and practices (Cote et al., 2004). Unlike Eastern Europeans, East African children are used to using chew sticks for oral hygiene and their traditional foods contain less sugar (Crespo, 2019). Ogawa et al. (2019) found refugee children from Asia had a 64% higher proportion of caries risk rates compared to refugee children from Africa.

There is also a significant difference by race. African refugee children had only half the caries experience of nonrefugee white or African American children (Cote et al., 2004). Even though African American children were more likely to see a dentist, they had similar untreated caries when compared to children of African refugees. This could explain many health disparities persisting in the United States. Cote et al. also found that children of white refugees were three times more likely to have caries experience compared to children of African Americans or children of white Americans.

Maternal oral health is related to child oral health because the mother can transfer her cariogenic bacteria to her child (Ijaz et al., 2021) by sharing a spoon with her child or kissing the child or pre-chewing food for her baby (Finnegan et al., 2016). In addition, most refugee mothers skip preventive dental care during pregnancy due to their mistaken belief that dental x-rays or other dental procedures might harm the fetus (Ijaz et al., 2021). In addition, Ijaz et al. noted that many refugees seek medical care for their children only if their children complain of feeling sick. Refugees are typically not aware of the importance of primary teeth if no pain exists. The priority for parents of refugee children is establishing medical care for their children before dental care (Cote et al., 2004). However, a study of Syrian refugee children found that oral health

is significantly associated with parents' perception of the negative impact on oral health related quality of life (Pani et al., 2017). This study revealed that dental pain is the biggest concern for parents. Other concerns are the access to oral health care and the children's oral health. The caregiver's knowledge of proper oral health care is likely to affect the child's risk of ECC. Such caregivers have been found to be less likely to understand that some of their traditional practices put their children at risk for ECC. For example, they might add sugar to their infant's formula or sweeten their pacifier with honey (Finnegan et al., 2016).

Kamimura et al. (2017) found providing an educational oral health program for refugees regarding good oral health practices is necessary to decrease the percentage of dental caries in these refugees. This should be done in spite of the fact that refugees come from different cultures and are unfamiliar with the health system in the United States. Kamimura et al. suggested that education about healthy food and reducing sugar intake should also be included. Establishing dental screening programs at pre-schools is another effective way to increase the number of dental visits and deliver preventive dental care to refugee children (Ijaz et al., 2021).

The application of SDF for arresting and preventing ECC among refugee children is recommended to be considered, as Rajendra (n.d.) stated, SDF is an effective, inexpensive, simple and atraumatic procedure. Dos Santos et al. (n.d.) compared the effectiveness of SDF with temporary fillings to arrest dental caries for underprivileged children and found the use of 30% SDF to a decayed tooth is 1.73 times more effective in arresting dental caries than interim restoration with glass ionomer cement after 12 months of application. Methods to manage and prevent dental caries in children without need for surgery is gathering interest. Silver Diamine Fluoride is an example of this, especially for tertiary prevention (Kyoon-Achan et al., 2021).

This could greatly improve the ability of the public health community's ability to deal with reducing the risk of dental caries in communities at high risk (Clemens et al., 2017).

Silver Diamine Fluoride

Silver diamine fluoride is a solution of ammonia, fluoride and silver ions. Silver diamine fluoride is used to reduce the demineralization process of enamel and dentine and reduces the growth of cariogenic bacteria (Gao et al., 2020). The role of the silver ions is antimicrobial and antibacterial. They act by "destroying bacterial membranes, denaturing proteins, and inhibiting DNA replication" (Chhokar et al., 2017). The job of fluoride ions is creating "fluorapatite, a more acid-resistant enamel which can prevent further demineralization of tooth structure" (Chhokar et al.). The addition of ammonia helps to dissolve silver fluoride salts in water (Sarvas & Karp, 2021).

Silver Diamine Fluoride is an alkaline solution. Thirty-eight percent of SDF contains 5% fluoride, 25% silver, 8% ammonia, and 62% water (State Specific Information on Silver Diamine Fluoride, 2020). The concentration of the fluoride in 38 % SDF is 44,800 parts per million (MacLean, 2020). Even with this high concentration, one drop of SDF consists of only 2.24 mg fluoride while the single dose of 5% sodium fluoride varnish consists of 11.3 mg of fluoride. Therefore, application of one drop of SDF is safe for each 10 kg of the patient's body weight. One drop of SDF treats approximately five to six carious lesions. Safe application of SDF requires the practitioner closely follow manufactures dosage instructions according to the patient's weight (Bowen, 2016).

In the United States, SDF was approved by the U.S. Food and Drug Administration (FDA) in 2014 to reduce teeth sensitivity (Food and Drug Administration, 2017). Kumer et al. (2019) cited that in 2017, SDF use was approved by the American Dental Association as a

treatment to arrest dental caries. Canada approved SDF for use in 2017 (Sihra, et al., 2020). However, the application of SDF was first approved by the Japanese FDA in 1970 (Maclean, 2018). Dental professionals in Australia and Brazil have used SDF since the 1980s. In both countries, studies have been done in vivo (Subbiah & Gopinathan, 2018). The FDA considered both 38% SDF and 5% sodium fluoride varnish as class II medical devices. However, 38% SDF is more effective in arresting caries than 5% sodium fluoride varnish (Alcorn & Johnson, 2018). As of early 2015, SDF became available for dental professionals in the U.S. market.

Different concentration of SDF solutions have been used to arrest carious lesions. A systematic review shows that 30% and 38% concentrations of SDF were effective in arresting dental caries in children's primary teeth and first permanent molars (Contreras et al., 2017). More recent studies have continued to demonstrate that 38% SDF is effective in arresting carious lesions in children's primary teeth (Daga et al., 2020; Fung et al., 2018; Yee et al., 2009). Other studies established the effectiveness of 38% SDF in preventing caries in anterior and posterior primary teeth (Oliveira et al., 2019; Sorkhdini et al., 2021). Yee et al. (2009) found that a 38% concentration of SDF was more effective than a 12% concentration. In a two-year period, a 38% solution produced a greater arrest of carious lesions regardless of the addition of a reducing agent.

Modasia and Modasia (2021) found that root caries in primary and permanent teeth can be treated with SDF. Modasia and Modasia mentioned that SDF is also effective in treating exposed root surfaces to reduce sensitivity. Another study suggested nano-silver fluoride (NSF) was effective in arresting caries without causing a dark stain (Santos et al., 2014). However, Akyildiz and Sönmez (2019) found NSF is not as effective as sodium fluoride varnish or SDF

solution. Although SDF does not necessarily provide a cosmetically pleasing result or function, the treated tooth is resistant to acidic substances and the surface hardened (ISAACS, 2021).

Bowen (2016) found the application of SDF treatment twice a year to arrest dental caries more effective than yearly over a period of 2-3 years. However, MacLean (2020) found a second application is not needed if cavities are filled or crowned following SDF treatment. MacLean also recommends application of SDF once a year to treat hypersensitivity. Silver Diamine Fluoride treatment is contraindicated for patients with mouth sores, ulcerative gingivitis, and silver allergy (Sarvas & Karp, 2021).

Even though SDF generally requires reapplication every six months or three weekly applications yearly, other treatment regimens exist (Bowen, 2016). Bowen suggested more research needs to be done before recommending more frequent application of SDF. In addition, caries does not need to be excavated.

The advantages of SDF are its low cost, that it is non-toxic and pain free, and only involves a simple topical application. The application of SDF does not cause aerosols so it can be used amid the worries of COVID-19 exposure (ISAACS, 2021) or other aerosolizing pathogens. However, the main negative side effect of SDF is the permanent black stain on the arrested carious lesion (Sarvas & Karp, 2021). This can cause distress for the child and its parents. Thus, there is a need for both full disclosure and well-informed consent (Bowen, 2016). Other adverse effects such as unpleasant metallic taste and gum irritation are only temporary (MacLean, 2020).

In addition, Duangthip et al. (2017) found SDF treatment safe for children as young as preschool, stating it “does not cause acute or serious systemic illness.” There were rare incidents of gum bleaching, oral pain or gum swelling which were not likely related to SDF application. Dental professionals, parents and caregivers need the most recent information about SDF,

particularly adverse effects, safety of the products used, and development of new methods to improve the end results - such as esthetics (Kyoon-Achan et al., 2021).

Crystal et al. (2017) studied SDF's acceptance by parents, particularly in relation to esthetic issues. Parents were more likely to agree to the placement of SDF on their children's posterior teeth. When made aware that the most likely alternative to SDF on anterior teeth was general anesthesia, the cutting of the tooth structure, and the placement of a dental restoration such as a filling, a majority agreed that SDF was a better option. Thus, dental professionals should be aware of parental perceptions and explain to the parents why SDF is a better alternative for primary teeth if compared to more invasive treatment. Kyoon-Achan et al. (2021) found parents would accept SDF treatment for their children if the dentist recommended it. Unfortunately, none of the parents in the Kyoon-Achan et al. study were aware of SDF prior to the study dentist's recommendation. Huebner et al. (2020) found that the decision to treat and the type of treatment should be shared between the dentist and the parents. Most parents in this study readily accepted SDF treatment. Daungthip et al. (2017) discovered the difference in parental acceptance of different concentrations (12% and 38%) of SDF was not significant. Even though the stain is darker with higher concentration and frequency, parental acceptance remained high. This study suggested that future studies of different cultures regarding parental acceptability of SDF (Daungthip et al., 2017). Bagher et al. (2019) found that parents more readily accepted SDF treatment for posterior over anterior teeth regardless of dentition and for primary over permanent as well as for uncooperative children. Crystal et al. (2017) agreed with Bagher et al. (2019) that parents are more likely to accept SDF for difficult patients particularly on anterior teeth.

As of 2020, Medicaid plans and private insurance plans cover the cost of SDF application in more than thirty states (MacLean, 2020). The current dental terminology (CDF) billing code

of SDF treatment is 1354 for “interim caries arresting medicament application” and is defined as, “Conservative treatment of an active, non-symptomatic carious lesion by topical application of a caries arresting or inhibiting medicament and without mechanical removal of sound tooth structure” (Fa et al., 2018). From a public health perspective, SDF could be a way to provide care and treatment of patients who find it difficult to obtain dental treatment (Bowen, 2016).

Silver Diamine Fluoride can benefit multiple populations, as well as provide treatment for primary teeth. It can benefit both special needs and elderly patients who are not amenable to standard treatment because of anxiety or inability to tolerate invasive procedures (Chhokar et al., 2017). Other patients for whom traditional treatment cannot be provided, such as those with “salivary dysfunction, Sjogren’s syndrome, polypharmacy, or methamphetamine abuse” can be successfully treated with SDF (Bowen, 2016). In addition, SDF can be used to manage dental caries for patients having cancer treatment because SDF can provide pain relief and reduce stress until the patient can have the tooth filled (ISAACS, 2021).

In some areas of the United States, SDF treatment must be provided by a dentist. Other areas allow a dental hygienist, doctor, nurse, or a physician’s assistant to do so. Medicaid in most states allows dental hygienists to apply SDF under the same rules as topical fluorides (State Specific Information on Silver Diamine Fluoride, 2020). Teledentistry is used to provide a dentists’ presence for SDF prescription and direction on application, allowing non dentists to treat patients where no dentist is physically available (ISAACS, 2021). However, SDF is mostly used in dental clinics.

Overall, SDF is safe, painless, and an excellent alternative to traditional dental treatment of caries. In addition, SDF is a good treatment option for a very young child who is not ready to sit on the dental chair, or a patient who cannot tolerate dental anesthesia, or for arresting caries to

maintain a tooth nearing exfoliation. Because SDF generates no aerosols, SDF can meet the infection control guidelines in a dental practice. Although SDF has been approved for use in the United States by the FDA since 2014, few parents are aware that it is a viable, less expensive, and less invasive treatment for ECC. Many children develop a fear of the dentist because they must undergo frightening and invasive procedures. Because SDF treatment is neither painful nor invasive, this fear is eliminated.

Chapter III: Methods

Setting

Women and children make up most of Idaho's refugees. The level of education of refugees varies from well-educated to little or no formal education. Refugees have come from many countries over the years, but most recently Idaho has welcomed many refugees from Iraq, Congo, Burma, Bhutan, Afghanistan, and Somalia (Idaho Office for Refugees, n.d.).

Sample/participants

Overall, thirty-four refugee parents participated. To be included, parents had to be 18 years of age or older, have a child 12 years of age or less, be living in Southwest Idaho, speak English or Arabic, and agree to participate in the study. A mixed methods survey was used to understand refugee parents' and caregivers' views and opinions regarding their acceptance of SDF to arrest ECC. Participants were primarily recruited through Agency of New American's refugee women's class using the survey as shown below. The Agency of New America's refugee women's class provides training several days of the week based on language groups. Participants also were encouraged to ask their refugee friends who were not in class to take part. Refugee parents were also recruited from the Islamic Center of Boise (Mosque) and Imam Hussain Islamic Center (Mosque). Other participants were recruited on social media (Facebook page for the Arabic community who live in Idaho).

Participant recruitment and survey completion occurred over a three-week span (between August 10 and August 29, 2021). The refugees were from Congo, Kenya, Burundi, Iraq, Syria, Nepal, and Afghanistan. Due to potential language barriers the survey was administered verbally through one-to-one interviews by this researcher. No interpreters were used because participants

were required to speak English or Arabic (the researcher spoke both languages). The survey questions received research approval from the ISU Institutional Review Board IRB-FY2022.

Measures

The focus of this pilot study is on refugee parents understanding and perception of SDF treatment. There were 20 questions developed for the survey which was divided into seven sections. The survey took 15-20 minutes to administer.

Section 1 obtained participant demographic information, such as whether they have children, how many, age and gender, how long the participant had been in the US.

Section 2 asked about the importance of primary teeth so that the level of awareness of the importance of primary teeth among refugees could be determined. It also asked that they rate that importance on the Likert scale. It also determined their knowledge of what a cavity is.

Section 3 determined how the child's behavior affects the parent's acceptance of SDF. The questions are about the child's anxiety, reaction to their last dental visit, and the child's behavior at the dental office.

Section 4 discovered how having dental insurance affects the parents' decision on treatment options. The questions determined whether the parent had dental insurance and what type. Also established were whether the child made regular dental visits, what procedures had been performed, and the parent's opinion of the procedure.

Section 5, determined the refugee parents' acceptance of SDF treatment as the main outcome variable. in particular the participant was asked to make a choice between invasive treatment or noninvasive but esthetically less pleasing topical treatment that leaves a stain.

Section 6 determined refugee parents' perception of SDF. In particular the questions established whether they were aware of SDF, what their understanding of it was, their concerns, their perceptions of SDF safety and effectiveness.

Section 7 determined the relationship between the education level and the acceptance of SDF treatment. In particular, it established the education levels of both primary and secondary caregivers.

Analysis

For the quantitative aspects of the survey, Jamovi was run. Bivariate analyses were used to determine factors associated with SDF acceptance. The Chi-square test for association was used for tables larger than 2x2, the chi-square continuity correction test for 2x2 tables, and Fisher's exact test for 2x2 tables with small counts. The alpha level was set to 0.05 to determine statistical significance. Because of the small sample size (n=34), no additional analyses were run. As a survey was conducted with help of an interviewer, there were no missing data.

For the qualitative survey, data analysis was conducted using HyperResearch. Interviews were copied and pasted in a word document. To maintain confidentiality, numbers and letters were used for each participant. Then a hyperresearch study file was created by opening the interviews in the hyperresearch application. This was then coded and thematically analyzed.

After reviewing the entirety of the selected responses, an appropriate term was assigned to each selected response to organize the data so that opinions could be analyzed by creating a codebook using HyperResearch's tools (Glesne, 2016). Each response was taken as a unit of analysis. This was helpful in in developing codes. The codes that were similar were then grouped together in order to develop a theme which encapsulated several codes. The 71 initial codes were

sorted into six different identifiable themes so as to better understand the opinions of refugee parents living in Idaho regarding the application SDF to manage ECC.

Chapter IV: Results

Thirty-two mothers and two fathers, a total of 34 participants, who came to the United States as refugees and had children 12 years of age or under participated in this study. Most participants had children between 6 and 12 years (44.1%). The quantitative data indicated that, overall, most participants considered primary teeth important, thought it was important to look after primary teeth, knew what a cavity was, had children who were anxious about dental visits, had Medicaid insurance, and made regular dental visits for their children. Restorative treatment, such as the placement of a dental restoration (filling) was the treatment option most recommended for their children.

From the qualitative data, six themes emerged: fear, cooperation, concerns, esthetics, awareness, and acceptance. Fear is children of refugee parents who are anxious and afraid of dental visits or injections. Cooperation is the positive or negative behavior of the child at the dental office. Concerns are factors related to decision making. Esthetics is the concern or lack of concern about the cosmetic side effect of the SDF treatment or filling. Awareness is the refugee parents' knowledge or lack thereof about SDF treatment. Acceptance is the refugee parents' agreement to or refusal of SDF treatment and the stain for primary teeth.

<u>Fear:</u>

Most children of refugee parents were afraid of dental visits or anesthesia. Reaction ranged from mild, expressing fear, to extreme, crying or refusal to enter the office:

"My son was scared of the shot, but after the shot he reverted back to normal."

"She was so scared about her appointment. They gave her some laughing gas. When they give her the shot she freaked out and was not cooperative."

Cooperation:

Reactions varied from good behavior to enjoying the visit. Some were cooperative at the dental office:

"Both of my children were behaving normally and acted like adults."

"All of my children behave good and they like the dental visit."

Others had a positive experience with filling or crown:

"The filling was good because my child doesn't complain of pain or discomfort. It is better to treat baby teeth than no treatment."

Concerns:

Some parents were concerned about the effect of nitrous oxide or general anesthesia:

"The treatment saved their baby teeth, keep their mouth healthy, I like how the dentist use x-ray to check for cavity in the teeth every six months. However, I don't like using general anesthesia or laughing gas for my children because I think it will affect their brain health."

Others had a negative experience with filling or crown:

"I don't think the treatment was right. I am against a crown because I think the crown will affect the permanent tooth coming in."

Esthetics:

Some parents had esthetic concerns:

"I didn't like the results because the color of the filling doesn't match the color of the tooth; however it was worth it to fix my children's teeth to relieve the pain."

Others accepted the stain on primary posterior teeth but not on anterior teeth:

"I have no real concerns because the stain is okay for the baby teeth but I really don't like the stain on the front teeth"

Another associated the black stain with caries:

"I thought the tooth were not treated because it was black, when I asked they said this what happens, the silver diamine fluoride turns decay black."

Awareness:

Most parents were not aware of SDF treatment.

"This is the first time I heard about this treatment."

Acceptance:

In general, most parents were not aware of SDF but they would accept it if recommended by the dentist:

"I don't think that my children's dentist mentioned this treatment. If the dentist recommends it, I would accept it."

Returning to the four research questions:

RQ1: What is the refugee parent's or caregiver's perception of SDF?

Most participants (31/34; 91.2%) were not aware of SDF treatment. 69.7% (23/33) of participants' children had never had SDF treatment, while 27.3% (9/33) of participants were unsure if their children had the treatment (Table1). From 23 responses about the information parents had about SDF and the reason of refusal of SDF treatment before this study, 20 (87%) of responses indicated a lack of awareness of SDF treatment; some parents reported that they would accept the treatment now that they understood it.

"I don't think that my children's dentist mentioned this treatment. If the dentist recommends it, I would accept it."

"I didn't refuse the treatment I had no idea about it. I would accept the treatment if the dentist recommended it."

"Nobody told me about it. I only know fluoride but never heard about silver diamine fluoride, may be my daughter didn't need it."

"I didn't refuse that treatment. The dentist recommended general anesthesia or laughing gas to do fillings for my daughter. For my 9 year old boy the decay was only in two teeth and the dentist recommended laughing gas but I refused to use the laughing gas, then he used local anesthesia and white filling. My little one did his filling at school and come back home with white filling."

The language barrier limited communication between parents and dentist about SDF treatment:

"I am not sure if the dentist mentioned this treatment. I don't speak English." (this has been translated from the participant's native language).

"I don't understand or read English." (this has been translated from the participant's native language).

Only three participants were aware about SDF treatment:

"It is a fluoride filling, better than drilling and filling the tooth."

"I heard that this material will darken the decay a little bit, but I don't have much information about it."

"It help to stop the decay, but turns the decay black."

From these three participants, who were aware of SDF, two participants thought SDF was only for adults:

"I don't remember that the dentist had recommend it for my children. The dentist had recommend it for me only"

"I don't remember them mentioning this treatment for my children"

RQ2: What do refugee parents or caregivers think about the efficacy and safety of SDF?

Some reponses indicated no concern about the safety or efficacy of SDF:

"I think it is safe because the dentist recommend it to save the tooth and I trust the dentist"

"My kids have had it for six months and they are fine."

"I think it is safe if the dentist recommend it."

"It may be effective but I am not sure."

"It is more effective than filling and crown and it is better than general anesthesia."

One response indicated concern of SDF safety for children:

"I don't think it is very safe for children but I don't have enough information to judge."

RQ3: What is the opinion of refugee parents or caregivers regarding the application of SDF to their children's primary teeth as opposed to restorative surgery?

When asked, 13 (38.2%) participants preferred filling and 13 (38.2%) preferred topical treatment for their children. However, when compared to surgery, 24 (70.6%) prefer SDF and would accept the stain. Only one participant had tried SDF for their children; this participant stated that they would recommend SDF to others (Table1).

RQ4: What factors are associated with refugee parents' willingness to accept SDF treatment for their children?

The age, gender, and child's anxiety, were not significantly associated with the parents' most important treatment goal regardless of the type of procedure ($P>0.05$) (Table 2). Similarly, the parents' highest level of education, acculturation, and knowledge of SDF treatment were also

not significantly associated with the parents' most important treatment preference regardless of the type of procedure.

Table 1: Respondent characteristics and perceptions of oral health and silver diamine fluoride among refugees in Southwest Idaho, 2021

	N (%)
Section 1: Participant information	
Do you have children	
Yes	34 (100)
How many children do you have 12 years or under	
1	8 (23.0)
2	14 (41.2)
3	7 (20.6)
4	5 (14.7)
What is the age of each child	
All under 6	8 (23.5)
Between 1 and 12	11 (32.4)
Between 6 and 12	15 (44.1)
What is the gender of each child	
Male	10 (29.4)
Female	11 (32.4)
Both	13 (38.2)
How long you have been in the United States	
Five years or less	18 (52.9)
More than five years	16 (47.1)
Section 2: Importance of primary teeth	
Are baby teeth important	
Yes	32 (94.1)
No	1 (2.9)
Unsure	1 (2.9)
How important it is to take care of baby teeth	
Extremely important	15 (44.1)
Very Important	6 (17.6)
Somewhat important	1 (2.9)
Neutral	12 (35.3)
Do you know what a cavity is	
Yes	25 (73.5)
No	8 (23.5)
Unsure	1 (2.9)
Section 3: child behavior	
Is your child anxious about dental visits	
Yes	16 (47.1)
No	15 (44.1)
Unsure	3 (8.8)
Section 4: dental treatment related to the child	
Do you have dental insurance	
Yes	32 (94.1)
No	2 (5.9)
What dental insurance do you have (if any) [a]	
Medicaid	29 (90.6)
Delta dental	3 (9.4)
Do you take your child to the dentist every six months	
Yes	19 (55.9)
No	15 (44.1)
Has your child had any dental procedures	
Yes	29 (85.3)

No	5 (14.7)
What dental treatment did your child have [b]	
Filling	21 (72.4)
Topical	1 (3.4)
Unsure	7 (24.1)
Section 5: treatment preference	
What kind of dental procedure would you prefer your child to have for tooth decay or cavity	
Filling	13 (38.2)
Sealant	7 (20.6)
Topical	13 (38.2)
None	1 (2.9)
What would you rather your child have: invasive treatment such as surgery or topical treatment such as putting a treatment solution on the decayed portion of the tooth that will leave a black stain on the decayed portion of the tooth	
Invasive	10 (29.4)
Topical	24 (70.6)
Section 6: parents' knowledge about SDF treatment	
Have you heard of Silver Diamine Fluoride SDF	
Yes	3 (8.8)
No	31 (91.2)
Did the dentist or dental hygienist discuss SDF treatment during the dental visit [c]	
Yes	1 (3.2)
No	21 (67.7)
Unsure	9 (29)
Did your child ever have a SDF treatment? [d]	
Yes	1 (3.0)
No	23 (69.7)
Unsure	9 (27.3)
Would you recommend SDF treatment to other parents to treat their children's primary teeth for decay (cavities) [e]	
Yes	1 (100)
Section 7: parent's level of education	
What is your educational levels	
Bachelor degree	7 (20.6)
Some college	2 (5.9)
Associate degree	6 (17.6)
High school	8 (23.5)
Less than high school	11 (32.4)
What is the second caregiver (if any) educational level	
Bachelor degree	5 (14.7)
Some college	1 (2.9)
Associate degree	6 (17.6)
High school	8 (23.5)
Less than high school	14 (41.2)

[a] sample size was 32
[b] sample size was 29
[c] sample size was 31
[d] sample size was 33
[e] sample size was 1

Table 2: Knowledge of Silver Diamine Fluoride and demographic characteristics of refugees in Southwest Idaho according to dental treatment preference

		Invasive or topical treatment preference			Treatment preference			
	Total	**Invasive**	**Topical**	**P.value**	**Filling**	**Sealant**	**Topical**	**P.value**
Child anxiety				1.000				0.856
No	15 (44)	4 (40)	11 (46)		5 (38)	4 (50)	6 (46)	
Yes	19 (56)	6 (60)	13 (54)		8 (61.5)	4 (50)	7 (54)	
Age				0.825				0.967
All under 6	8 (24)	2 (20)	6 (25)		3 (23)	2 (25)	3 (23)	
Between 1 and 12	11(32)	4 (40)	7 (29)		4 (31)	2 (25)	5 (38)	
Between 6 and 12	15 (44)	4 (40)	11 (46)		6 (46)	4 (50)	5 (38)	
Gender				0.775				0.164
Male	10 (29)	3 (30)	7 (29)		6 (46)	1 (13)	3 (23)	
Female	11(32)	4 (40)	7 (29)		3 (23)	5 (63)	3 (23)	
Both	13 (38)	3 (30)	10 (42)		4 (31)	2 (25)	7 (54)	
Parents highest level of education, n (%)				1.000				0.53
Post high school degree	17 (50)	5 (50)	13 (54)		7 (54)	5 (63)	5(38)	
High school or less	17 (50)	5 (50)	11 (46)		6 (46)	3 (38)	8 (62)	
Years in the US				1.000				0.105
5 years or less	18 (53)	5 (50)	13 (54)		8 (62)	6 (75)	4 (31)	
More than 5 years	16 (47)	5 (50)	11 (46)		5 (38)	2 (25)	9 (69)	
Knowledge of SDF				0.201				0.916
No	31 (91)	8 (80)	23 (96)		12 (92)	7 (88)	12 (92)	
Yes	3 (9)	2 (20)	1 (4)		1 (8)	1 (13)	1 (8)	

Chapter V: Discussion

To the best of our knowledge, this is the first mixed method study involving the opinions of refugee parents who live in Idaho regarding the application of SDF treatment on their children's primary teeth and determining the factors influencing refugee parents' decisions. In general, most participants were unaware of SDF treatment (91.2% unaware). The qualitative study reinforced this result. Frequency clouds demonstrate the term "previously unaware about SDF" is prevalent (Figure 1). Most refugee parents were not aware of SDF treatment prior to participating in this study, and said that they would accept the SDF treatment if the dentist recommended it for their children. Kyoon-Achan et al. (2021) also found parents would accept SDF treatment for their children if the dentist recommended it. Unlike this study where a few parents had heard about SDF, none of the parents in the Kyoon-Achan et al. study was aware of SDF prior to the study dentist's recommendation. Kyoon-Achan et al did not mention whether any participants in their study were refugees (2021). Given most refugees do not speak English fluently, the language barrier limits their ability to understand the dentist's recommendations for treatment for their children. Only three participants were aware of SDF treatment. Two of them thought SDF treatment was only for adults. Only one refugee participant had children who received SDF treatment.

Some participants had no concern about safety and efficacy if the dentist recommended it. However, one participant thought SDF was not safe for children. There were concerns about the visible black stains on anterior teeth. However, participants were more accepting of SDF for posterior teeth where the stains are not visible. The acceptance of SDF treatment increased to 70.6%, despite the esthetic consequences, when compared to invasive procedures such as surgery. In the Crystal et al. (2017) study, parents were also less accepting of SDF treatment on

anterior teeth. Parent's acceptance of SDF treatment even given esthetic issues changed once they were made aware that the alternative would be general anesthesia, cutting of the tooth structure, and the placement of a dental restoration. Again, we do not know if this study included refugee participants.

Factors such as the child's anxiety, gender, and age, the parents' acculturation, knowledge of SDF treatment, and parent's highest educational level did not show significant effects on the parents' decision. This lack of statistical significance is potentially due to the small sample size, rather than the lack of an actual association. There was a preference for the less invasive type of procedure but that preference was not significantly related to any factor. While the Bagher et al., (2019) study found that parents more readily accepted SDF treatment for uncooperative children. This study did not include refugee participants.

The Health Belief Model is useful to interpret and predict factors related to refugee parent's intentions to accept SDF treatment for their children. The health belief model suggests that a person's behavior regarding their health is directly related to their beliefs and attitudes. To formulate the survey questions for this study, acculturation factors were considered. These factors included refugee parents' knowledge about the importance of primary teeth which may influence their perception of the benefits of SDF (Kumar et al 2019).

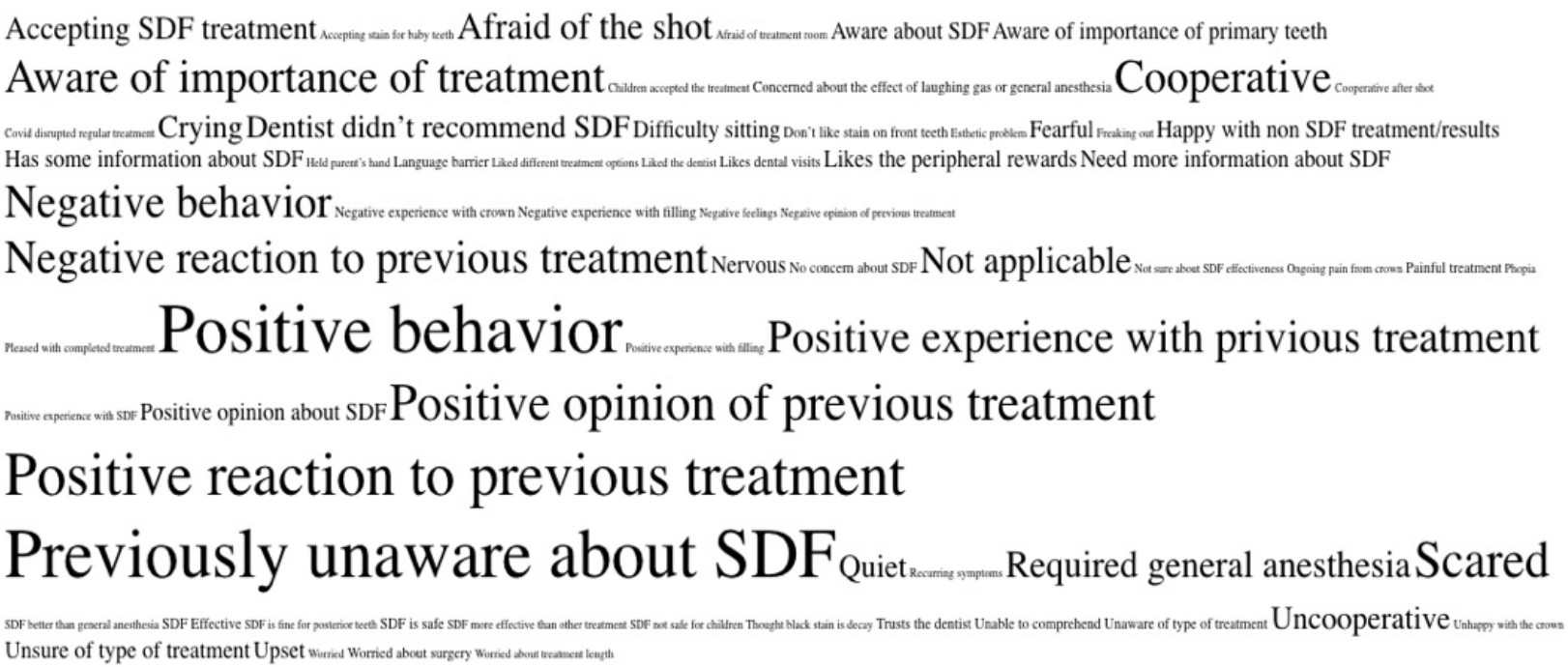
One limitation of this study is the small sample size. Because of that, the findings cannot be generalized to the entire refugee population. Recruiting more refugee participants for this study was difficult due to the Covid-19 pandemic. A limited number of the refugee population were able to join the refugee women's classes or Mosques where data collection was done because of fear of face-to-face contact and contracting Covid-19. Because many had not heard of SDF treatment, and a dental filling was the most recommended treatment, their choices were

limited. A larger study that includes refugee parents whose children have been treated with SDF would be required to provide a clearer understanding of the choices they would make as SDF treatment can be a way to benefit multiple populations. In the future, it would be interesting to investigate the acceptance of SDF among parents with medically compromised children.

Overall, SDF is a good treatment option for a very young child who is not ready to sit on the dental chair, or a patient who cannot receive dental anesthesia, or for arresting caries to maintain teeth nearing exfoliation. Moreover, SDF is a good treatment option during the Covid-19 pandemic especially for children under 12 who cannot have the covid-19 vaccines because the treatment generates no aerosol. Informing parents about SDF is a good method to raise their awareness of SDF treatment and to expand its use. Information about oral health and the safety, effectiveness, and adverse effect of SDF treatment in the refugee's native language is needed to increase their awareness and reduce the oral health disparities in children of refugees. Dentists or dental hygienists need to use before and after pictures of SDF treatment for more clarification, especially to parents with limited or no English.

These findings indicate that refugee parents are aware that the primary teeth will be replaced by permanent teeth so they would sacrifice aesthetic outcomes for a less invasive procedure. From a public health view, because parent perception and acceptance of proper dental care and their ability to pay for that care are the main barriers to treatment, this study contributes to the public health community's ability to reduce the oral health disparities and risk of childhood caries in refugee communities. This can also have an effect on protecting and improving oral health among the refugee population.

Figure 1: Frequency cloud



References

Akyildiz, M., & Sönmez, I. S. (2019). Comparison of Remineralising Potential of Nano Silver Fluoride, Silver Diamine Fluoride and Sodium Fluoride Varnish on Artificial Caries: An In Vitro Study. Oral Health & Preventive Dentistry, 17(5), 469–477.

Alrashdi, M., Cervantes Mendez, M. J., & Farokhi, M. R. (2021). A Randomized Clinical Trial Preventive Outreach Targeting Dental Caries and Oral-Health-Related Quality of Life for Refugee Children. International Journal of Environmental Research and Public Health, 18(4). https://doi-org.libpublic3.library.isu.edu/10.3390/ijerph18041686

Anil, S., & Anand, P. S. (2017, June 27). *Early Childhood Caries: Prevalence, Risk Factors, and Prevention*. Frontiers. https://www.frontiersin.org/articles/10.3389/fped.2017.00157/full.

Alcorn, M., & Johnson, T. (2018, June 12). *Silver Diamine Fluoride (SDF): New Addition to the Caries Armamentariium*. Dimensions of Dental Hygiene. https://dimensionsofdentalhygiene.com/article/new-addition-to-the-caries-armamentarium/.

Bagher SM, Sabbagh HJ, AlJohani SM, Alharbi G, Aldajani M, Elkhodary H. Parental acceptance of the utilization of silver diamine fluoride on their child's primary and permanent teeth. Patient Prefer Adherence. 2019 May 23;13:829-835. doi: 10.2147/PPA.S205686. Erratum in: Patient Prefer Adherence. 2019 Aug 22;13:1431. PMID: 31213777; PMCID: PMC6536810.

Batalova, J., Hanna, M., & Levesque, C. (2021, May 14). *Frequently Requested Statistics on Immigrants and Immigration in the United States*. migrationpolicy.org. https://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states-2020#Now.

Bowen, D. M. (2016). Effectiveness of Professionally-Applied Silver Diamine Fluoride in Arresting Dental Caries. Journal of Dental Hygiene, 90(2), 75–78.

Berkowitz, R. J. (2003, May). *Causes, treatment and prevention of early childhood caries: a microbiologic perspective*. Journal (Canadian Dental Association). https://pubmed.ncbi.nlm.nih.gov/12734024/.

Burgette, J. M., & Quiñonez, R. B. (2018, October). *Cost-effectiveness of Treating Severe Childhood Caries under General Anesthesia versus Conscious Sedation*. JDR clinical and translational research. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6992433/.

Cannon, M. (2007, Feb). *Early Childhood Caries: Taking Treatment Out of the Hospital*. Early Childhood Caries: Taking Treatment Out of the Hospital | Dentistry Today. https://www.dentistrytoday.com/pediatric-dentistry/1577--sp-445217718.

Cianetti, S., Pagano, S., Nardone, M., & Lombardo, G. (2020, May 26). *Model for Taking Care of Patients with Early Childhood Caries during the SARS-Cov-2 Pandemic*. International journal of environmental research and public health. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7312964/#B19-ijerph-17-03751.

Chhokar, S. K., Laughter, L., & Rowe, D. J. (2017). Perceptions of Registered Dental Hygienists in Alternative Practice Regarding Silver Diamine Fluoride. Journal of Dental Hygiene, 91(4), 53–60.

Clemens, J., Gold, J., & Chaffin, J. (2017, July 27). *Effect and acceptance of silver diamine fluoride treatment on dental caries in primary teeth*. Wiley Online Library. https://onlinelibrary.wiley.com/doi/full/10.1111/jphd.12241.

Colak, H., Dülgergil, C. T., Dalli, M., & Hamidi, M. M. (2013, January). *Early childhood caries update: A review of causes, diagnoses, and treatments*. Journal of natural science, biology, and medicine. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3633299/.

Contreras V, Toro MJ, Elías-Boneta AR, Encarnación-Burgos A. (2017). *Effectiveness of silver diamine fluoride in caries prevention and arrest: a systematic literature review*. General dentistry. https://pubmed.ncbi.nlm.nih.gov/28475081/.

Cote, S., Geltman, P., Nunn, M., Lituri, K., Henshaw, M., & Garcia, R.I. (2004). Dental caries of refugee children compared with US children. Retrieved April 15, 2021, from https://pubmed.ncbi.nlm.nih.gov/15574605/

Crespo, E. (2019, September 9). *The Importance of Oral Health in Immigrant and Refugee Children*. MDPI. https://www.mdpi.com/2227-9067/6/9/102/htm.

Crystal, Y. O., & Niederman, R. (2019). *Evidence-Based Dentistry Update on Silver Diamine Fluoride*. NYU Scholars. https://nyuscholars.nyu.edu/en/publications/evidence-based-dentistry-update-on-silver-diamine-fluoride.

Crystal, Y. O., Janal, M. N., Hamilton, D. S., & Niederman, R. (2017, April 27). *Parental perceptions and acceptance of silver diamine fluoride staining*. The Journal of the American Dental Association. https://www.sciencedirect.com/science/article/pii/S0002817717302738.

Daga, S., Shetty, V., & Hegde, A. (2020). Silver Diamine Fluoride in Arresting Dentinal Caries in School Children. Indian Journal of Public Health Research & Development, 11(3), 530–535

Dos Santos VE;de Vasconcelos FM;Ribeiro AG;Rosenblatt A;. (n.d.). Paradigm shift in the effective treatment of caries in schoolchildren at risk. Retrieved April 22, 2021, from https://pubmed.ncbi.nlm.nih.gov/22251037/

Duangthip D, Fung MHT, Wong MCM, Chu CH, Lo ECM.; (2017 Dec 13). *Adverse effects of silver diamine fluoride treatment among preschool children*. Journal of dental research. 2018 Apr;97(4):395-401. doi: 10.1177/0022034517746678. PMID: 29237131

Fa, B. A., Horst, J. A., Hirsch, J. P., Duffin, S., Wong, A., & Young, D. A. (2018, May 31). *Arresting Caries*. Dimensions of Dental Hygiene. https://dimensionsofdentalhygiene.com/article/Arresting-Caries/.

Filstrup, S.L., Briskie, D., da Fonseca, M., Lawrence, L., Wandera, A., & Inglehart, M.R. (2003). Early childhood caries and quality of life: Child and parent perspectives. Retrieved April 23, 2021, from https://pubmed.ncbi.nlm.nih.gov/14649606/

Finnegan, D., Rainchuso, L., Jenkins, S., Kierce, E., & Rothman, A. (2016). Immigrant Caregivers of Young Children: Oral Health Beliefs, Attitudes, and Early Childhood Caries Knowledge. Journal of Community Health, 41(2), 250–257. https://doi-org.libpublic3.library.isu.edu/10.1007/s10900-015-0090-5

Food and Drug Administration. Diammine Silver Fluoride Dental Hypersensitivity Varnish. 510(k) Premarket Notification; 2017. Available at: http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm?ID=K102973. Accessed 2018 Dec 20.

Fung MHT, Duangthip D, Wong MCM, Lo ECM, Chu CH. Randomized Clinical Trial of 12% and 38% Silver Diamine Fluoride Treatment. *Journal of Dental Research*. 2018;97(2):171-178. doi:10.1177/0022034517728496

Gao, S. S., Chen, K. J., Duangthip, D., Wong, M. C. M., Lo, E. C. M., & Chu, C. H. (2020, February 4). *Preventing early childhood caries with silver diamine fluoride: study protocol for a randomised clinical trial*. Trials. https://trialsjournal.biomedcentral.com/articles/10.1186/s13063-020-4088-7.

Glesne, C. (2016). *Becoming qualitative researchers: An introduction*. Boston: Pearson.

Greenwall-Cohen, J., Greenwall, L., & Barry, S. (2020, June 12). *Silver diamine fluoride - an overview of the literature and current clinical techniques*. Nature News. https://www.nature.com/articles/s41415-020-1641-4.

Heiser, A. (2020). *Integrating Oral Health in Primary Care to Reduce Early Childhood Caries (ECC): Evidence-Based Guidelines and Recommendations*. ScholarWorks @ UVM. https://scholarworks.uvm.edu/fmclerk/569/.

Huebner CE, Milgrom P, Cunha-Cruz J, Scott J, Spiekerman C, Ludwig S, Mitchell M, Allen G, Dysert J, Shirtcliff RM. Parents' Satisfaction with Silver Diamine Fluoride Treatment of Carious Lesions in Children. J Dent Child (Chic). 2020 Jan 15;87(1):4-11. PMID: 32151304.

Idaho Office for Refugees. (n.d.). *Resettlement in Idaho*. Retrieved November 29, 2021, from https://www.idahorefugees.org/resettlement-in-idaho.html.

ISAACS, K. (2021). The advantages of silver diamine fluoride for cancer patients. RDH, 41(4), 30–33

Jewell, T. (2018, November 7). *Silver Diamine Fluoride*. Healthline. https://www.healthline.com/health/silver-diamine-fluoride.

Ijaz, S. (2021, January 23). Refugee children: How dental hygienists help welcome them to new country. Retrieved April 15, 2021, from https://www.todaysrdh.com/refugee-children-how-dental-hygienists-help-welcome-them-to-new-country/

Kamimura, A., Booth, C., Sin, K., Pye, M., Chernenko, A., Meng, H., . . . Erickson, L. (2017, November 20). Home dental Care education for Refugee BACKGROUND adults in the United States. Retrieved April 15, 2021, from https://diversityhealthcare.imedpub.com/home-dental-care-education-for-refugeebackground-adults-in-the-united-states.php?aid=21040

Kerns K. (2019). *What to Know About Silver Diamine Fluoride - PDG Dental: Pediatric Dentistry & Orthodontics*. PDG Dental | Pediatric Dentistry & Orthodontics. (2021, March 23). https://www.pdgdental.com/what-to-know-about-silver-diamine-fluoride/.

Kumar, A., Cernigliaro, D., Northridge, M. E., Wu, Y., Troxel, A. B., Cunha-Cruz, J., Balzer, J., & Okuji, D. M. (2019, October 24). *A survey of caregiver acculturation and acceptance of silver diamine fluoride treatment for childhood caries*. BMC Oral Health. https://bmcoralhealth.biomedcentral.com/articles/10.1186/s12903-019-0915-1.

Kyoon-Achan, G., Schroth, R. J., Martin, H., Bertone, M., Mittermuller, B. A., Sihra, R., Klus, B., Singh, S., & Moffatt, M. E. K. (2021). Parents' Views on Silver Diamine Fluoride to Manage Early Childhood Caries. JDR Clinical & Translational Research, 6(2), 251–257.

MacLean, J. (2020, March 10). *A Practical Guide to Silver Diamine Fluoride*. Dimensions of Dental Hygiene. https://dimensionsofdentalhygiene.com/article/a-practical-guide-to-silver-diamine-fluoride/.

MacLean, J. (2018, December 11). *Clinical Uses for Silver Diamine Fluoride*. Oral Health Group. https://www.oralhealthgroup.com/features/clinical-uses-for-silver-diamine-fluoride/.

Magno, M. B., Silva, L. P. da, Ferreira, D. M., Barja-Fidalgo, F., & Fonseca-Gonçalves, A. (2019, March 13). *Aesthetic perception, acceptability and satisfaction in the treatment of caries lesions with silver diamine fluoride: A scoping review*. Wiley Online Library. https://onlinelibrary.wiley.com/doi/abs/10.1111/ipd.12465.

Martins-Júnior PA, Vieira-Andrade RG, Corrêa-Faria P, Oliveira-Ferreira F, Marques LS, Ramos-Jorge ML., (n.d.). Impact of early childhood caries on oral health-related quality of life of preschool children. Retrieved April 22, 2021, from https://pubmed.ncbi.nlm.nih.gov/25793957/

Meyer, B. D., & Danesh, D. O. (2021, January 15). *The Impact of COVID-19 on Preventive Oral Health Care During Wave One*. Frontiers. https://www.frontiersin.org/articles/10.3389/fdmed.2021.636766/full.

Modasia, R., & Modasia, D. (2021, April 28). *Application of silver diamine fluoride as part of the Atraumatic Restorative Technique*. Nature News. https://www.nature.com/articles/s41406-021-0199-1.

Nunn, M., Dietrich, T., Singh, H., Henshaw, M., & Kressin, N. (2009, January 16). Prevalence of early Childhood Caries among very young Urban Boston children compared with us children. Retrieved April 23, 2021, from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1752-7325.2008.00116.x

Ogawa, J. T., Kiang, J., Watts, D.-J., Hirway, P., & Lewis, C. (2019). *Oral Health and Dental Clinic Attendance in Pediatric Refugees*. Latest TOC RSS. https://www.ingentaconnect.com/contentone/aapd/pd/2019/00000041/00000001/art00004.

Oliveira, B. H., Rajendra, A., Niederman, R., & Veitz-Keenan, A. (2019). The Effect of Silver Diamine Fluoride in Preventing Caries in the Primary Dentition: A Systematic Review and Meta-Analysis. Caries Research, 53(1), 24–32. https://doi-org.libpublic3.library.isu.edu/10.1159/000488686

Pani SC, Al-Sibai SA, Rao AS, Kazimoglu SN, Mosadomi HA, (2017 Jul-Aug). *Parental Perception of Oral Health-related Quality of Life of Syrian Refugee Children*. Journal of International Society of Preventive & Community Dentistry. https://pubmed.ncbi.nlm.nih.gov/28852635/.

Patel, J., Foster, D., Smirk, M., Turton, B., & Anthonappa, R. (2021). Acidity, fluoride and silver ion concentrations in silver diamine fluoride solutions: a pilot study. Australian Dental Journal, 66(2), 188–193. https://doi-org.libpublic3.library.isu.edu/10.1111/adj.12822

Rajendra, A. (n.d.). Topical silver diamine fluoride for managing dental caries in children and adults. Cochrane Database of Systematic Reviews, 7

Raskin, S. E., Tranby, E. P., Ludwig, S., Okunev, I., Frantsve-Hawley, J., & Boynes, S. (2021, January 20). *Survival of silver diamine fluoride among patients treated in community dental clinics: a naturalistic study*. BMC Oral Health. https://bmcoralhealth.biomedcentral.com/articles/10.1186/s12903-020-01379-x.

Reza, M., Amin, M. S., Sgro, A., Abdelaziz, A., Ito, D., Main, P., & Azarpazhooh, A. (2016, February 8). Oral health status of immigrant and refugee children in north america: A

scoping review. Retrieved April 20, 2021, from https://pubmed.ncbi.nlm.nih.gov/27548669/

Santos, V. E. dos, Filho, A. V., Targino, A. G. R., Flores, M. A. P., Galembeck, A., Caldas, A. F., & Rosenblatt, A. (2014, June 12). *A New "Silver-Bullet" to treat caries in children – Nano Silver Fluoride: A randomised clinical trial*. Journal of Dentistry. https://www.sciencedirect.com/science/article/pii/S030057121400164X.

Sarvas, E., & Karp, J. M. (2021, May 29). *Silver diamine fluoride arrests untreated dental caries but has drawbacks*. American Academy of Pediatrics. https://www.aappublications.org/news/2016/08/05/SilverDiamine080516.

Shen, A., Bernabé, E., & Sabbah, W. (n.d.). *The bidirectional relationship between weight, height and dental caries among preschool children in China*. PLOS ONE. https://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0216227.

Sihra, R., Schroth, R. J., Bertone, M., Martin, H., Patterson, B., Mittermuller, B.-A., Lee, V., Patterson, B., Moffatt, M. E., Klus, B., Fontana, M., & Robertson, L. (2020). The Effectiveness of Silver Diamine Fluoride and Fluoride Varnish in Arresting Caries in Young Children and Associated Oral Health-Related Quality of Life. Journal (Canadian Dental Association), 86, k9.

Sorkhdini, P., Crystal, Y. O., Tang, Q., & Lippert, F. (2021). The effect of silver diamine fluoride in preventing in vitro primary coronal caries under pH-cycling conditions. Archives of Oral Biology, 121, N.PAG. https://doi-org.libpublic3.library.isu.edu/10.1016/j.archoralbio.2020.104950

State Specific Information on Silver Diamine Fluoride. (2020). Access, 34(9), 32–37.

Stevanović, M., Cvetković, A., Stošović-Kalezić, I., Bukumirić, Z., Milojković, Z., Martinović,

B., Stevanović, N., Lazić, D., Jovičić, O., & Ivanović, M. (2021). Early childhood caries predictors. Vojnosanitetski Pregled: Military Medical & Pharmaceutical Journal of Serbia, 78(2), 207–214. https://doi-org.libpublic3.library.isu.edu/10.2298/VSP181121060S

Subbiah, G. K., & Gopinathan, N. M. (2018). Is Silver Diamine Fluoride Effective in Preventing and Arresting Caries in Elderly Adults? A Systematic Review. Journal of International Society of Preventive & Community Dentistry, 8(3), 191–199. https://doi-org.libpublic3.library.isu.edu/10.4103/jispcd.JISPCD_99_18

Yee R, Holmgren C, Mulder J, Lama D, Walker D, van Palenstein Helderman W. (2009). *Efficacy of silver diamine fluoride for Arresting Caries Treatment*. Journal of dental research. https://pubmed.ncbi.nlm.nih.gov/19641152/.