

# Knowledge, Education And Attitude Regarding Silver Diamine Fluoride Of General Practitioners And Dental Specialist In And Around India

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## Abstract

**Objectives:** To assess the Knowledge, education and attitude regarding Silver Diamine Fluoride of general practitioners and dental specialist in and around India

**Methodology:** A questionnaire based cross-sectional study was carried out on the sample size of 226 dental surgeons. All dentists from India were invited to participate in the survey. An online multiple-choice and fill-in response questionnaire was created in Google Forms. The data obtained were compiled systematically and then statistically analyzed. Both descriptive and analytical statistical measurements were done.

**Results:** A lack of self-reported knowledge was most frequently reported concerning whether a restoration must be placed after SDF treatment even if SDF is being reapplied twice per year, whether SDF can be used on root caries lesions, and under which codes SDF treatment can be billed.

**Conclusion:** Education and understanding of SDF through expert development activities might bring about greater usage of this innovative method of managing cavitated caries lesions, especially in children.

**Keywords** dental specialist, General practitioners, Silver Diamine Fluoride

## INTRODUCTION

Dental caries is one of the most prevalent dental diseases<sup>1</sup> and it can have a negative impact on oral health-related quality of life and dental therapy, as reported by several dental health studies. Untreated teeth cavitation is related with pain, ingesting, drinking, and problems with sleeping. Since Dental caries is a progressing disease, and treating it as early as possible can prevent the infection, avoid or improve the longevity of tooth and their structures and also help patients to avoid risky procedures.<sup>2</sup> As in primary prevention, a secondary approach that uses treatment-as-prevention are primarily important when implemented at the higher population organization. Dental public health and oral health partners seek to prevent dental caries and treatment strategies which are secure, simple, effective, low

expense, negligibly obtrusive, and amenable to delivery in most of the community settings and various participants of dental treatment teams.<sup>3</sup>

Dental caries is primarily managed by two methods: prevention which focuses on repressing caries progression, and the traditional method, which relies on treating caries through drilling and filling. For decades in restorative dentistry, the use of the drill-and-fill approach was the only available treatment of dental caries that showed substantial efficacy within the United States. However, the cost of treatment is high and thus, access is limited to those from low-socioeconomic groups. Thus, dental caries requires alternative treatment.<sup>4</sup>

Silver diamine fluoride (SDF) is a colourless, odourless alkaline solution that has been used effectively to arrest carious lesions in those who incapable to endure invasive treatment, children, elderly populations, and medically compromised have additional care and support. Although various claims on mechanism of SDF is contested,<sup>5</sup> it has been found to offer tooth desensitization and carious lesion arrest by dentinal tubule blockage, cariogenic bacterial death, remineralization of the demineralized tooth, and inhibition of dentinal collagen degradation. SDF is a reliable, effective, safe and affordable agent for prevention of dental caries and its validity in primary as well as permanent teeth caries management is documented.<sup>6</sup> Also, it can be used in arresting and prevention of coronal and root caries in grown-ups with high caries risk, to those with limited access to dental care and who require more than one visit. SDF can also be used to reduce teeth sensitivity. The main advantage of SDF is that it is affordable and its ease of application. Standard restorative dental treatment involves sophisticated procedure requiring the use of rotary burs along with local anesthesia and the need for highly trained dental health practitioners. The discomfort and pain associated with cavity preparation in conventional methods has resulted in many patients hesitant to seek dental treatment. As a conservative approach, SDF can prevent extensive repairs, eliminate post-operative pulpal symptoms and prevent the weakening of tooth resulting from invasive removal of caries.<sup>7</sup>

However, dentist may hesitate to choose this type of treatment since its major drawback is the aesthetic outcome that results in a black stain on arrested carious teeth. There is scanty literature and research carried out in past many years regarding the knowledge of SDF amongst dental professionals. Since surveys based on SDF would increase the eagerness in this context and lead to increase use with minimal approach. Hence, the aim of the study was to investigate general dentist and dental specialists views on exploring the use of “Silver Bullet”.

## **Methodology**

### **Study design**

The present cross-sectional study employed a survey to solicit responses from General practitioners and dental specialist in and around India about their knowledge, education and attitude regarding Silver Diamine Fluoride. Ethical approval has been sought from the Institutional Ethical Clearance at Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow. Data were collected from December 2021 to February 2022.

### **Participants and sample**

The sample size estimation was done using nMaster software (version 2, CMC, Vellore) and an absolute precision of 5%, and a 95% confidence interval, assuming the population size as, a sample size of 221 was found to be sufficient. Three groups of dental practitioners (General practitioner and Dental specialists) practicing in and around India were recruited for this cross sectional study.

### **Recruitment of the study participants**

One method of survey administration was used: online electronic survey. The online form of the questionnaire was created by the Principal Investigator through Google Forms. Known colleagues of dental practitioners (GDPs, and DSs) were invited to participate in the survey by sending the online questionnaire's link via e-mails. The e-mail explained the study, stated that participation was anonymous and voluntary, and enclosed a link to accede to the survey

without signing in to google. The study researchers had no access to the personal data of participants. Participants were also asked to forward the invitation link of the survey to their colleagues in India. General practitioners and Dental specialist who agreed to participate voluntarily have completed and submitted the online questionnaire anonymously and confidentially. In the cover information sheet, participants were asked not to fill the questionnaire again if they had already done before. Two e-mails, which were two to three weeks apart from the first e-mail, were sent as reminders. Out of 300 invited dental practitioners, a total of 221 GPs, and DSs completed the questionnaire.

## Data collection tool

An electronic questionnaire was used to assess Knowledge, education and attitude of dental professionals' views exploring the use of SDF in India. This questionnaire was already validated and applied in a similar study in Egypt. (Zakirulla M et al 2021)

The questionnaire consisted of a cover information sheet which included an invitation for participation, the aim of this study, A valid set of questions, easy to understand and finish within a reasonable amount of time were included in the questionnaire. The questionnaire was formulated and comprised of two parts: The first portion included the questions related to the demographic information of participants, such as age, sex, and educational level (dentists, specialists) and the other part of the questionnaire comprised of 11 questions. Piloting was done to obtain information about knowledge, education and attitude among dentists towards Silver Diamine Fluoride.

## DISCUSSION

This magical bullet SDF is applied topically on the tooth surface to arrest the carious lesion. The lesion arrest can be arrested completely by painting this liquid form of SDF over the infected carious lesion. It is believed that SDF can be used as a promising and alternative treatment particularly in pediatric patients who cannot tolerate the conventional dental treatment, procedures involving the use of arotors and also can reduce the need of dental treatment to be performed under general anesthesia which is commonly associated with health issues.

As supported by American Academy of Pediatric Dentistry (AAPD), use of 38% SDF in primary teeth is suggested as a comprehensive caries management plan for arresting the cavitated lesion. A systematic review was created by Chibinskiet al. (2017)<sup>8</sup> who stated the level of evidence supporting SDF use to be high in primary teeth. The success rate of SDF increased to 84.8% in arresting the caries when it was applied for two years. It is also seen that there can be a dose response to the effectiveness of SDF, as compared to 12% SDF solution, 38% SDF solution was found to be more effective.

Concerning the education related to the use of SDF, General dentist (28.9%) and Specialist (71%) had heard about the material silver diamine fluoride out of which general dentist (11.60%) and specialist (43%) had attended lectures related to this particular topic. In spite of the poor educational experiences regarding SDF, dentists knowledge through online resources, dental journals/ other publications, and dental organizations found to assist in adding the knowledge regarding SDF.

The results were in accordance with the study conducted by Ballaji and Matthew (2020)<sup>9</sup> who stated that the increase in educational experience in paediatric dentistry or with specialist when compared to BDS was not surprising because one of the main target population for SDF is use in children. SDF education in pediatric dentistry will likely to continue over period of time and the knowledge about SDF will be increasing. This finding is likely due to their professional development education.

Depending upon the responses which was submitted by the general dentists and specialist, it was found that general dentists (27.30%) and specialist (52%) were aware of the type of lesion where application is to be done. As stated by Raskinet al.(2021)<sup>3</sup> SDF alone prevents non-cavitated lesions and arrest early decay on primary teeth (in

particular upper primary incisors and upper and lower primary cuspids) and on permanent teeth (in particular, lower permanent bicuspid) including children's permanent teeth, in contrast to other recent findings. Use of SDF prior to restorations because clinical studies concerning the role of SDF in prevention of secondary caries are limited and have had conflicting conclusions, despite in vitro data suggesting a positive role. Taking into consideration the application to be done on the anterior or posterior teeth, the awareness amongst general dentist (33.10%) and specialist (59.00%) were remarkable. As stated by Crystal et al.(2017)<sup>10</sup>, the effectiveness of one- time SDF application in arresting dental caries lesion ranges from 47 percent to 90 percent, depending on the lesion size and the location of the tooth and the lesion. As stated by Yee et al. (2009)<sup>11</sup>the percentage of arresting the carious lesion decreased in two years after a single application was done over the period of time. He also stated that applying SDF twice have been more effective as compared to single application and that anterior teeth had higher rates of caries lesion arrest than posterior teeth. General dentist (14.90%) and specialist (55%) agreed to the fact that SDF can be used as an alternative to drill. According to Antonioniet al.(2019)<sup>12</sup> most of the respondents (82%) stated that they agreed that SDF can be used to arrest cavitated lesions in dentin. This use is well supported by existence evidence by Gao et al.(2016)<sup>13</sup>. Similar responses were also found in a study with pediatric dentistry program by Chu et al.(2002). When it was talked about the acceptance by the parents for the use of SDF general dentist (10.70%) pediatric dentist and (44%) submitted the correct response. As stated by Alajlanet al. (2020)<sup>14</sup>parental acceptance of teeth discoloration found to be on the anterior teeth 90% strongly refuse, while on posterior teeth 28.4% refuse and 68.5% strongly refuse.Also, a study demonstrated that parents' acceptance and decisions differ depending on whether it is a posterior or anterior tooth.Despite parental intolerance of the black discoloration, a wide range of them would still accept SDF application to avoid extensive dental behavioral management such as general anesthesia or sedation.General dentist (13.20%) and specialist (46%) believed that there is no need of LA application before the use of SDF and considering the application protocol whether it has to be applied single application or annually or at 4 weeks , general dentist (12.40%) and specialist (12.40%) submitted the correct response. This result was in accordance with Raskinet al.(2021)<sup>3</sup>,who stated its acceptability among dentally undeserved patient groups for use on posterior dentition , and when posited to parents as a safe, minimally invasive and effective alternative to procedures that could be painful or for which their children might otherwise be sedated, with particular suitability for children with behavioural challenges, often surpassing provider preference for using SDF.

On the other hand, considering the cost related to SDF application, general dentists (28.10%) and specialist (39.00%) believed that it is cost effective. This result was in accordance with Gao et al.(2021)<sup>15</sup>who stated that SDF was considered a non-invasive and promising strategy to manage dental caries, especially when the conventional restorative treatments were not applicable, available or affordable in some cases because of its relatively low cost and simplicity of application. As mentioned by Crystal et al. (2017)<sup>10</sup>SDF is an effective and in expensive means of arresting cavitated caries lesions in primary teeth. It is inexpensive due to the low cost of materials and supplies and relatively short chair time required for application. Amongst 221 applicants only few general dentists (5.80%) and specialist (3.00%) stated that application of SDF does not arrest caries. These results were in accordance with Gao et al.(2021)<sup>15</sup> who stated that 38% SDF is effective in arresting early childhood caries (ECC); around 80% of the carious surface became arrested after SDF application. Additionally, they mentioned that SDF can be applied and it does not restore the shape and function of the particular tooth morphology which was in support of our result i.e general dentist (3.30%) and specialist (2.00%) believed the same. On comparing the knowledge gained regarding application of SDF, general dentist (40.50%) and specialist (9.00%) mentioned about inadequate training as one of the major barriers for its use. The results were supported by Bridge et al (2020)<sup>7</sup>. Dental practitioners knowledge and experience of SDF varied significantly from being unaware of it prior.According to Zhi et al. (2012)<sup>16</sup>, the easy application procedure of SDF relative to its counterparts, such as drilling and filling (which are distasteful to some patients), is an advantage. Parents had statistically significant higher acceptance of SDF when used on posterior teeth. General dentist (40.50%) and specialist (9.00%) felt that inadequate training is the main barrier for the use of SDF. Bridge et al.(2020)<sup>7</sup> found that dental practitioners knowledge and experience of SDF varied significantly, from being unaware of it prior to the interview, to having used it in practice. Alongside guidance, training events or workshops to familiarise dental practitioners with SDF when it is appropriate to use it as an "off-license" product were suggested by dental

practitioners as it would be helpful in overcoming some of their perceived barriers. General dentist (7.40%) and specialist (10.00%) believed that lack of scientific knowledge is the main reason for use of SDF. When light was thrown on patients acceptance, general dentist (9.90%) and specialist 9.00% believed that it may be a possible barrier for its use in dentistry. As stated by Chibinskiet al. (2017)<sup>8</sup>SDF is easy to apply (even by dental assistants) and quite affordable. Since its application does not require dental equipment , it can be used outside the clinical environment. The product is well accepted even by young children since it can be applied without caries removal (Chu et al 2002) . Therefore, SDF can be considered as a user friendly material for use in dental clinics as well as remote areas, schools or deprived communities. But there is a unique characteristic that hampers a broader acceptance of this product: the staining of the teeth after SDF application. Considering this major drawback on tooth staining, results of our study stated that general dentist (5.00%) and specialist (18.00%) thought that it causes blackening of the tooth. As stated by Crystal et al (2017)<sup>10</sup> the main disadvantage if SDF is its aesthetic result (i.e permanently blackens enamel and dentinal caries lesions and creates a temporary henna-appearing tattoo if allowed to come in contact with skin). Skin pigmentation is temporary since the silver does not penetrate the dermis. Desquamation of the skin with pigmentation occurs when keratinocytes are shed over a period of 14 days. Silver diamine fluoride also permanently stains most surfaces (eg counters, clothing) with which it comes into contact.

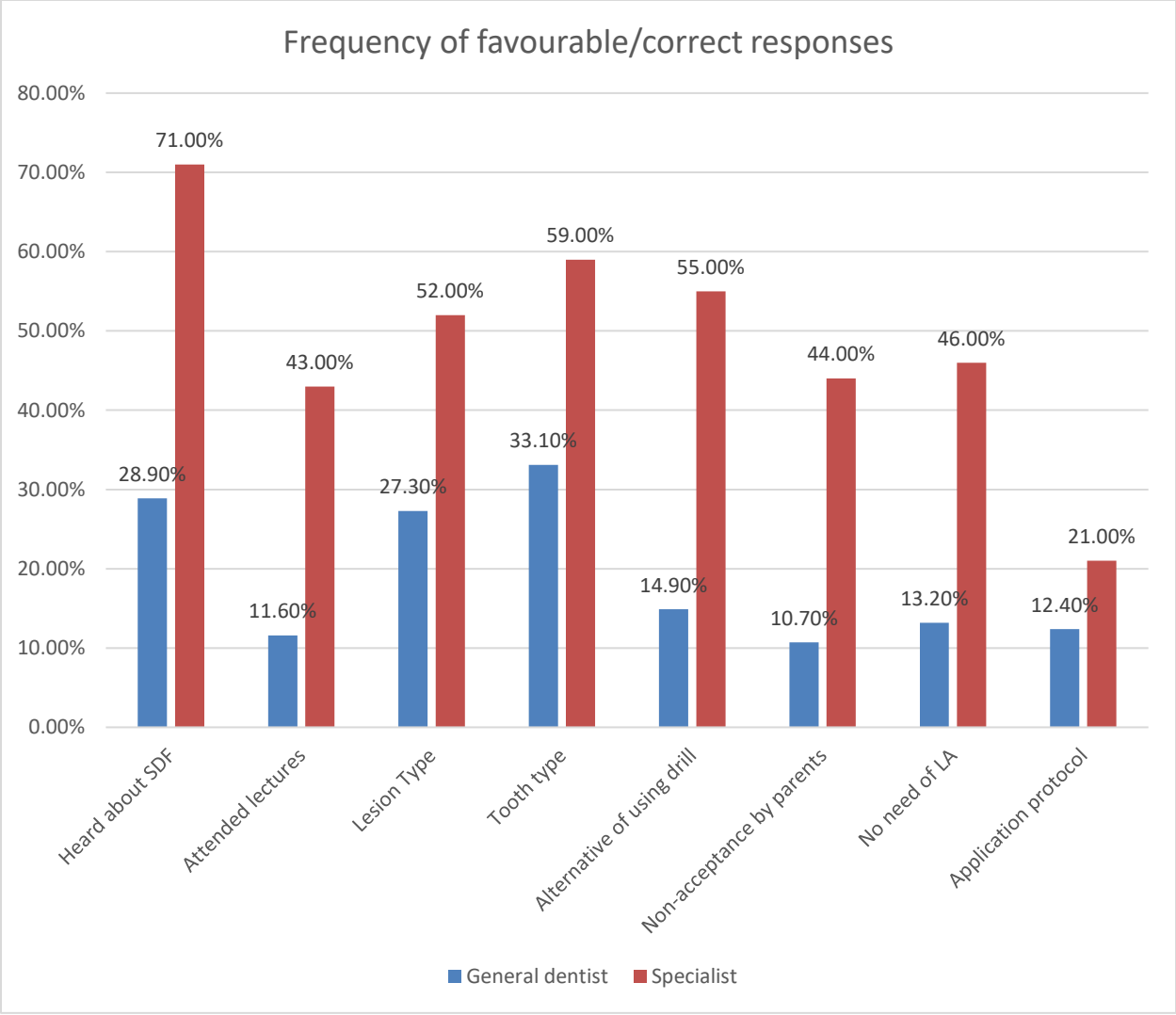
The study encountered multiple limitations. Firstly, the awareness about the material is less due to the lack of education which might contribute to the high percentage of neutral responses among participants. Secondly, SDF is only recently approved thus a lack of long exposure and clinical experience of SDF might affect dentists' decisions and preferences regarding such treatment. Further studies with more focus on larger samples including dentists from other sectors and different regions are needed to provide more conclusive and generalized findings is therefore suggested. Moreover, this study raises many questions and sheds light on areas that should be explored in future studies. Including, areas of education experience and teaching practices can provide very helpful information that can identify the source of gaps in the current knowledge of dentists.

## RESULTS

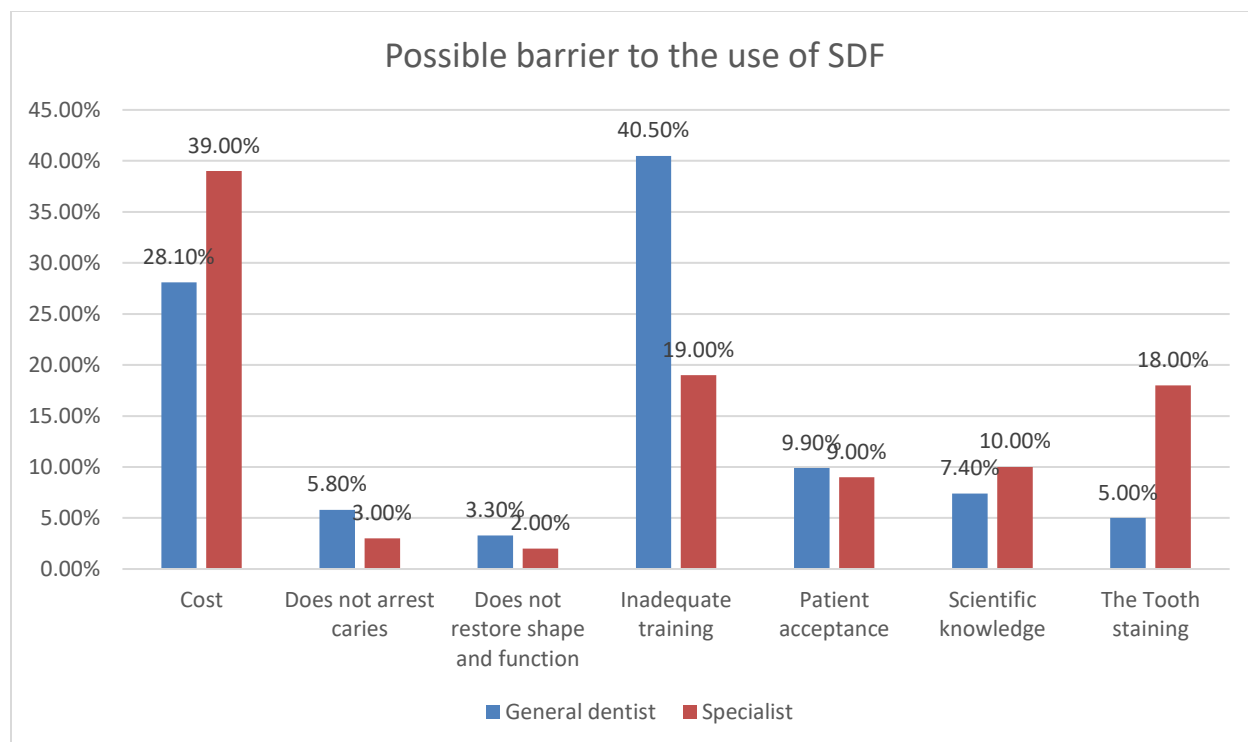
A total of 221(131 males and 90 females) General practitioners and Dental Specialists responded to the questionnaire. 49% of study subjects were of 20-30 years, 46% were of 31- 40 years, 3% were of 41-50 years, and 0.9% were >50 years (Table 1). The distribution of study samples according to a level of education was shown in Graph.

Knowledge and attitude towards Silver Diamine Fluoride were shown graph1Significantly higher proportion of specialists (71%) heard about SDF as compared to general dentist (28.9%). Compared with general dentist (11.6%), more specialist (43%) attended lectures on SDF. A total of 52% specialist knew the type of carious lesion for which SDF is used while 27.3% knew about it. 59% of specialist were aware about the type of tooth, for which SDF is indicated.i.e. anterior or posterior while 33.1% of general dentist were aware about it.Greater number of specialist (55%)believed that it is the alternative of dental drill while only 14.9% of general dentist believed it. 10.70% general dentist and 44% specialist felt that it is non-acceptance by the parents. (46%) specialist and (13.2%) general dentist agreed to the fact that LA is not required before application of SDF. (21%) specialist and (12.4%) general dentist knew about theapplication protocol for the use of SDF.

Graph 2 provides an overview of the possible barrier for use of SDF. (28.10%) general dentist and 39.00% of specialist felt that it is cost effective. 5.80% general dentist and 3.00% specialist believed that it does not arrest caries. 3.30% general dentist and 2.00% specialist felt that it does not restore shape and function while 40.50% general dentist and 9.00% specialist felt that inadequate training is the major barrier to the use of SDF. 9.90% general dentist and specialist believed patients acceptance to be a factor for the use of SDFand 7.40% general dentist and 10.00% specialist felt that inadequate scientific knowledge is a barrier for application of SDF. Furthermore 5% general dentist and 18.00% specialist perceived that tooth staining is the major barrier.



Graph 1: Frequency of favourable/correct responses



Graph 2: Possible barrier to the use of SDF

## CONCLUSION

This study finds that silver diamine fluoride applied independently or concurrently with a sedative or restorative procedure is an effective treatment that prevented non-cavitated lesions and arrested early decay among numerous tooth types and patient demographic groups among a population receiving care in community settings over the course of 1 year. SDF is a valuable option for preventing or arresting early stage dental caries that can improve patient and population-level oral health and that complies with immediate- and long-term dental service delivery transformations to maintain patient care while minimizing risk for transmission of airborne pathogens. Professional organizations, policy makers, dental and medical providers, dental payors, and patients themselves should consider the relative success of this treatment in informing clinical practice guidelines, reimbursement policies, and treatment decisions, while also exercising cautions due to the limitations of this study. Future research should address clinical, social, health service delivery, work-force, and economic outcomes including costs and invasive procedures deferred, using diverse population-based samples.

## Clinical Significance:

Silver diamine fluoride if applied early can prevent pain, sepsis and need for extraction in case where cavity is present but has not caused irreversible pulpal damage. It is more effective at 38% concentrations than lower concentrations, and biannual application is more effective than yearly application. Furthermore, it attracts community support and engagement with parents who do not traditionally take their children to the dentist. It can improve equity and accessibility to caries treatment especially for individuals from low-socioeconomic settings. Therefore, material of choice SDF is a non-invasive alternative treatment to conventional methods (drill and fill) in dental caries management.

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