



## Review Article

## Feasibility of community-based silver diamine fluoride (SDF) initiatives for dental caries control: An Indian perspective

Amina Sultan<sup>1\*</sup>, Akanksha Juneja<sup>1</sup>, Maryam Siddiqui<sup>1</sup>, Gurvinder Kaur<sup>2</sup>

<sup>1</sup>Faculty of Dentistry, Jamia Millia Islamia University, New Delhi, India

<sup>2</sup>Private Practitioner, Virginia, United States of America



## ARTICLE INFO

## Article history:

Received 28-09-2023

Accepted 03-11-2023

Available online 18-12-2023

## Keywords:

Dental Caries Arrest

Dental Caries Control

Dental Public Health

Early Childhood Caries (ECC)

Silver Diamine Fluoride (SDF)

Community-based programme

## ABSTRACT

Early childhood caries (ECC) continues to affect most children globally, especially in developing nations. Many cases of caries are left untreated, particularly in low- and middle-income countries, because these countries have large populations, restricted medical resources, and rising demand for dental health services. Community-based care can effectively meet the requirements by providing direct access to places where children reside, attend school, or obtain regular assistance. Countries like Hong Kong, Mongolia and the United States of America are successfully running programmes and focusing on community-based Silver Diamine Fluoride (SDF) to control dental caries in children. SDF can be applied in any setting, does not require sophisticated dental equipment, and can lower healthcare expenses and limit the global burden of dental caries. SDF should be a part of various oral health promotion schemes in a developing country like India, where a significant portion of the population belongs to economically weaker strata. This review article aims to discuss the effectiveness of SDF in various community-based dental caries programmes and to encourage its usage as an accessible and reasonable alternative to enhance the oral health-related quality of life in a developing country like India.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial 4.0 International](https://creativecommons.org/licenses/by-nc/4.0/), which allows others to remix, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: [reprint@ipinnovative.com](mailto:reprint@ipinnovative.com)

### 1. Introduction

Early childhood caries (ECC) continues to affect most children globally, especially in developing nations, because these countries are highly populated with reduced medical assets and growing expectations for dental health services.<sup>1–3</sup> In Asia, especially in the Far East, dental caries prevalence lies between 36% to 85% in 3-year-olds. In India, the reported prevalence of caries is 50% in 5 years old<sup>4,5</sup> and 44%–49% among 8–48-month-old children.<sup>6</sup> In a recent meta-analysis of caries prevalence studies in India, the pooled prevalence of ECC was 46.9%, and the pooled mean was 2.23 among Indian children.<sup>7</sup> That means one in every two children in India is afflicted with ECC, reflecting

its public health relevance.

India, China, and Indonesia have a substantial number of patients with caries and approximate years lived with disability (YLDs) across all age groups. Based on the findings by E. Bernabe et al., these countries had the highest dental treatment requirements for carious lesions, periodontitis, and tooth loss between 1990 to 2017.<sup>8</sup> According to a report published in 2019, there were 3.09 billion additional patients of untreated dental caries in permanent dentition worldwide, representing a 48.00% increase since 1990. In addition, caries in permanent teeth accounted for approximately 2.03 billion (46.07% increase since 1990), and years lived with disability (YLDs) for caries of permanent teeth reached almost 2.00 million (45.64% increase since 1990). Also, the report mentioned there were 1.15 billion incident cases of caries in primary

\* Corresponding author.

E-mail address: [asultan@jmi.ac.in](mailto:asultan@jmi.ac.in) (A. Sultan).

dentition globally, and years lived with disability (YLDs) for caries of primary teeth were approximately 0.20 million.<sup>1</sup>

Untreated carious lesions in children remain a significant challenge for pediatric dentists universally. It could be because most of them cannot afford conventional dental treatment for caries. Additionally, due to poor cooperation and discomfort during routine drill-and-fill procedures, treating young children with extensive caries under sedation is generally the only practical option which is expensive, risky, and technically complex.<sup>9,10</sup> Consequently, the treatment rate in preschool children remains low.

Meanwhile, untreated dental caries occurrence is also linked adversely with the patient's socioeconomic status. Children belonging to lower economic backgrounds and those whose parents have limited schooling have a higher likelihood of dental caries incidence.<sup>11,12</sup> Dental treatment's high costs, especially related to dental caries and the absence of dental insurance, impose a significant financial strain on families and healthcare professionals.<sup>13,14</sup> Eventually, ECC is worsened in a population living in deprived areas, where subjects with dental caries are neglected due to insufficient financial means and resources.<sup>15</sup>

A lack of appropriate and timely dental treatment in children can have adverse repercussions on their life, physical development, and academic progress; therefore, prompt treatment is crucial.<sup>10,16</sup> The child with untreated decay suffers from acute pain and discomfort, including infection, sepsis, and tooth loss when dental caries involves dental pulp. Untreated carious lesions can even exacerbate or even induce systemic complications.<sup>1</sup> Meanwhile, carious exposure during childhood can also impact oral health in adulthood<sup>17</sup> since children with caries in their primary teeth in infancy or as toddlers are further prone to have dental caries in permanent teeth.<sup>18,19</sup> It underlines the significance of caries prevention, which calls for increased awareness of the disease's social and environmental causes, besides its behavioural and biological risk factors.<sup>20</sup> Henceforth, it is advisable that, in the coming times, dental associations collaborate with government bodies to execute comprehensive preventive and control measures related to oral health activities.

In addition, currently, dental professionals worldwide are dealing with the consequences of interrupted oral health care during the Covid-19 pandemic.<sup>21,22</sup> There was a delay in necessary face-to-face treatment during that period, and the dental treatment of children was the least among all age groups. Most dental patients, including children with dental decay, did not visit their dentists due to the phobia of catching the dreadful covid-19 infection through dental treatment. Eventually, this has resulted in more pediatric patients with dental caries.<sup>21</sup> In Wuhan, China, approximately 60.8%, 35.5% and 18.3% of preschool-aged children reported having dental cavities, toothache, and

halitosis, respectively.<sup>23</sup> Looking at the present conditions of the Covid-19 global spread, it does not seem to be extinct soon, and dentists should focus on newer approaches laying stress on caries prevention.

## **2. SDF (Silver Diamine Fluoride) at the Community Level: The Reasons for Present Need**

Fluoride in dental products is economical, safe, and successful in lowering the incidence, severity, and spread of dental caries in a population. As specified in the FDI policy statement, at optimum levels, it can effectively prevent and treat incipient carious lesions in children and adults. The guideline issued by FDI also urges the adoption of policies that promote far-reaching expansive health initiatives that enable the unrestricted utilization of inexpensive fluoride in appropriate concentration.<sup>24</sup> Over the past 70 years, the prevalence and acuteness of dental caries have significantly come down due to the large-scale use of fluoride in drinking water and fluoride-containing oral products.<sup>25</sup> However, in most countries, not all sections of society have been exposed to the various advantages of these preventive initiatives. In most countries, mass fluoridation programmes do not exist, and there is minimal use of fluoridated toothpaste. Besides, a well-managed approach to fluoride delivery is a must to avoid the risk of fluorosis. Hence, an innovative, community-based approach is required to safeguard that everyone gets the benefits of fluoride and the difficulties of caries are handled judiciously. One way to meet these requirements is to provide direct community-based care where children reside, attend school, or obtain usual assistance.<sup>26</sup> Integrating community-based care approach will be more effective in reducing the existing inequalities in disease burden, which involves universal access to primary oral healthcare, dental health promotion and treatment of oral diseases, including dental caries.<sup>27</sup>

The introduction of silver diamine fluoride (SDF) as a caries-preventive therapy is a game-changer and is gaining ample consideration from many researchers in clinical settings. In 2015, SDF became commercially accessible in the USA,<sup>28</sup> adding to the innovative means of non-invasive caries management. With a focus on reducing the inequalities in caries experiences, SDF will be a suitable and cost-effective therapeutic agent for use in community-based oral health schemes involving young children, elderly subjects, and those with special needs.<sup>16,29</sup> This therapeutic agent is economical and easy to apply. The clinicians working on experimental studies on caries prevention support that SDF is extra effective than fluoride varnishes in arresting carious lesions.<sup>30</sup> The utilization of SDF for managing caries at a community level can be a potential asset that may strengthen the prevention on a large scale and help overcome the dental caries crisis.<sup>31,32</sup> Although SDF usage across countries varies greatly, it is presently easily obtainable. Most European and American dentists

have formulated guidelines for SDF use; it is often a part of clinical advice for caries management. In India, where 68.84% of the population still lives in rural areas and belongs to economically weaker strata,<sup>33</sup> SDF can be a way forward. SDF application is becoming more common in India, but there are no formal guidelines or specific recommendations for its dental application.<sup>32</sup> SDF can lower healthcare expenses as it can be applied in any setting and does not require sophisticated dental armamentarium, local anaesthesia, or training.

### 3. Inclusion of SDF in Various Preschool Dental Caries Prevention Programmes

Early Childhood Caries in pediatric patients cannot be solely managed by the standard therapeutic techniques, especially in developing countries like India, where the dental facilities are not uniformly distributed.<sup>30</sup> The effectiveness of SDF for caries arrest and caries prevention in younger children has been supported by a large amount of research. Many countries frequently use 38% (44,800 ppm fluoride ions) SDF solution to arrest dental caries in deciduous dentition, especially in pediatric patients who are challenging to treat.<sup>31</sup> SDF application involves a *seal and heal* treatment modality; that is economical and safe to use.<sup>29</sup> Hence, SDF application could extend an attractive therapeutic alternative for those lacking adequate dental care with a minimally invasive (MI) treatment approach.<sup>16</sup> Revised AAPD guidelines (2018) also endorse the incorporation of SDF in the currently formulated caries management strategy to improve the individualized treatment of patients.<sup>34</sup>

#### 3.1. An insight from school-based dental caries prevention programmes outside India

##### i) “Carried Away” and Carried Away 2.0 programmes in the USA

Government mediations in the United States have funded many ongoing research projects to specifically indicate SDF for caries arrest in children and add it to school-based caries prevention schemes in communities where dental facilities utilisation is poor and children are more vulnerable to caries.<sup>32</sup> A school-based action, “Carried Away,” was primarily started in 2003. The programme involved the usage of toothbrushes, toothpaste, fluoride varnish, and GIC restorations in preventing cavities. This approach led to a considerable decrease in untreated caries after six years.<sup>35</sup> Following a similar protocol but using SDF instead of glass ionomer, “Carried Away 2.0” was started. *Carried Away 2.0*, a currently ongoing cluster of randomized control trials, involves about 25,000 schoolchildren residing in New York and New Hampshire. It is one of the large-scale caries reduction programmes among US schoolchildren. The initial result indicates a decline in caries in both

regions, despite decreased treatment expenses and time. There were about 33% reductions in the treatment expenses and duration (10-minute treatment time, compared to 30 minutes; and USD25 compared to USD70).<sup>16</sup> Additionally, the researchers supporting the SDF programme’s efficacy, assert that these initiatives might eradicate 80% of dental caries for less than 20% of what Health plans presently spend on children’s oral health needs.<sup>16,36</sup> In conclusion, the *Carried Away programmes* involve children, and the findings may apply to a wide range of population groups globally.

##### ii) “Preschool Oral Health Programme” in Hong Kong

Another example of a community-based dental Scheme involving the use of SDF for caries reduction or arrest is the “Preschool Oral Health Programme” involving more than 200,000 preschool children in Hong Kong, started by the Faculty of Dentistry from the University of Hong Kong.<sup>16</sup> ECC affects about half (51%) of 5-year-old children in Hong Kong. Over this, 90% of ECC cases go untreated, and two-thirds (72%) of patients never visit a dentist. Due to the uneven distribution of caries experience in Hong Kong, particularly among underprivileged children, school-based interventions allow an efficient and balanced caries treatment option that is not dependent on dental awareness or dental practice. The Faculty of Dentistry at Hong Kong University is assisting parents and kindergarten instructors in resolving this situation. With the support of the Government Health Care Promotion Fund, the faculty started a 2-year experimental outreach dental service in 2008; and improved oral health remarkably within six months by preventing and controlling tooth decay in 19 kindergartens. These schemes involved increasing the awareness of oral health among teachers and parents, free oral examination and 38% silver diamine fluoride application in children with ECC in the participating schools with parental consent.<sup>36,37</sup> This overwhelming appreciation motivated the researchers involved in the project to introduce the SDF application over the entire territory. As a result of its success, the SK Yee Medical Foundation provided funding in 2010 to extend the service for two years to 100 kindergartens. Following this, private dentists can provide dental care when the child moves out of the school.<sup>37,38</sup> Several randomized clinical trials have assessed the efficacy of SDF in arresting dental caries in preschool children in Hong Kong. According to a 30-month duration study, the authors observed 55.2% and 66.9% of caries -arrests with 12% and 38% of SDF annual applications;<sup>39</sup> and another group of researchers showed that 48% of caries arrest with 30% SDF solution.<sup>40</sup> These findings indicate that SDF therapy could help preschoolers worldwide, including those who suffer from dental caries.<sup>41</sup>

#### 4. Use of SDF as Triage Service in Resource-Poor Indigenous Communities

There have been persistent inequalities in the dental well-being of the Indigenous populations,<sup>42</sup> and these disparities continue to increase in many countries.<sup>43,44</sup> The people of tribal areas, including children and adults, deal with tremendous health disparities from their mainstream counterparts because of geographical disadvantages.<sup>45</sup> With an array of more life-threatening illnesses, dental suffering is regarded as less important. 80% of global indigenous populations are affected by many oral diseases. More percentage is observed for untreated dental caries and missing teeth due to pathology. Among children aged 5–6 years, 69% have caries experience,<sup>46</sup> most of which is untreated.<sup>47–49</sup> In India, 74.7% of ECC prevalence is seen in tribal children compared to their mainland population.<sup>50</sup> SDF as a therapeutic modality for caries prevention and treatment for disadvantaged inhabitants, would be a game changer and can support a community not having direct access to routine curative treatment for caries.<sup>51</sup>

##### 4.1. SDF use in aboriginal communities in Australia

SDF has been used in Aboriginal children in Australia since traditional dental caries therapy is not possible in remote communities. According to unpublished data from the Rans Yawary-led Melbourne Dental Hospital, the non-invasive SDF therapy significantly reduced the percentage of pediatric patients who required general anaesthesia for treating carious lesions and minimised pain and infection in cases with extensive dental caries.<sup>16</sup> Also, many respiratory and skin infections are commonly seen in Aboriginal children living in remote areas. Kids are frequently quite reluctant to use needles as intramuscular antibiotics are routinely used to treat them. Another factor is that training practices involving children in such areas lay stress on autonomous behaviour, and children can allow or reject dental care services at a much tender age.<sup>52</sup>

The most suitable and tolerable treatment in the remote setting, recommended by the World Health Organization (WHO), is atraumatic restorative treatment (ART).<sup>53</sup> Silver fluoride 40%, followed by 10% stannous fluoride (SnF), was equally successful as ART in treating children with carious lesions in an everyday clinical setting in remote Australia. For many years, this therapeutic procedure has been used by dentists in some parts of Australia. It was easy to use and favourably accepted by young indigenous children in remote areas for treating dental caries in primary molars.<sup>41</sup>

Unpublished reports from Tasmania Dental Health Services encourage SDF therapy in inaccessible areas. It is because of better dental care access with SDF, is not expensive, does not require long durations of waiting and limits the necessity for multiple hospital visits. As such, SDF facilitates crucial triage assistance in remote areas

where inhabitants struggle with extensive dental problems. Lastly, studies indicate that SDF application does not necessitate the removal of carious tooth tissue to prevent disease progression, which safeguards the tooth structure, making therapy favourable with time.<sup>16,41</sup>

#### 5. SDF as Part of Collaborative Efforts Between Government and Private Practitioners

There is insufficient research on the actual SDF usage by dentists, particularly in the private sector in many countries. Fewer than 30% of Pediatric dentistry programmes use SDF while more than 90% use fluoride varnish. In a few countries, pediatric dental training schools have readily adopted silver diamine fluoride, and many anticipate incorporating it in their teaching clinics and curricula.<sup>54</sup>

##### 5.1. “Healthy teeth—healthy child”: Mongolia

In Mongolia, the Ministry of Health (MOH) approved the Citizen’s Law on Health Insurance in 1993, which became effective in 1994, to enhance the accessibility of necessary health services at a national level, regardless of income, thus guaranteeing its benefits for the vulnerable population.<sup>55</sup> In the project: “Healthy Teeth—Healthy Child” (2019–2023), the SDF application for arresting dental caries in younger children is part of the essential dental care services. The Mongolian Ministry of Health collaborated with private dental clinics to implement the initiative and created a separate fund to subsidise dental care. For the dental examination and treatment (including SDF) for every patient aged 2 to 6 years, it pays USD 21 in the first year, and the government intends to increase the allocated funds to USD 46 second year onwards till the programme gets completed for kids aged 7 to 12 years. As a result, 176 private clinics participated in the programme between July 2019 and October 2020, and SDF was applied on 55,761 primary teeth of 145,028 examined children.<sup>32,55</sup> In 2004, the School of Dentistry of the Mongolian National University of Medical Sciences formulated the Standard guidance and recommendations for SDF therapy (MNS 5372-6). It was developed so that dentists may use SDF to control dental cavities in children under the age of 12 and, by arresting them, improve the management outcome.<sup>32</sup>

#### 6. SDF Use in Medically Compromised and Community-Dwelling Geriatric Populations

Elderly populations globally have a higher occurrence of untreated dental caries because of ageing and rising life expectancy, increasing the demand for oral care.<sup>56</sup> Furthermore, root caries in elderly individuals is another healthcare issue worldwide. Older patients are more susceptible to developing root caries than younger patients because of decreased salivary flow due to ageing and drugs, a poor diet, and exposure to roots due to gingival

recession.<sup>57</sup> In addition, elderly adults have reduced access to dental services due to their complicated dental problems, a lack of financial resources, mobility issues, and other factors, which causes dental caries to persist and go untreated.<sup>58</sup>

Although different countries report variable rates of root caries in the elderly, a sizeable portion of the lesions is frequently untreated active decay.<sup>59</sup> According to a recent oral health analysis in Hong Kong, 25% of community-dwelling people between the ages of 65 and 74 had root caries, and 80% did not receive any treatment.<sup>60</sup> Therefore, SDF can be a safe and efficient therapeutic option for individuals with medical problems and those living in community settings. SDF can prevent the progression of dental caries in ambulatory or palliative care patients without adding to the difficulties usually present during their transportation to a dental facility for treatment. Since, in these kinds of situations, it might be difficult to safely treat patients with severe dementia or mental illnesses as they might fail to understand dental and medical treatments, SDF can be a suitable therapeutic option. Active dental root caries were arrested effectively by topical application of 38% SDF solution among community-dwelling elders in water-fluoridated territories in a randomized clinical trial on arresting dentinal root caries using silver diamine fluoride.<sup>59</sup> Similarly, in another study among the community-dwelling elderly population, a single application of SDF annually combined with biannual dental hygiene instructions helped prevent new root caries and root caries arrest.<sup>61</sup> Hendre et al. (2017)<sup>62</sup> observed that root caries prevented fraction and the arrest rate for SDF was significantly higher than placebo in the only systematic review of SDF on adults. Compared to the placebo, prevented fraction of caries prevention for SDF was 71% in a 3-year study and 25% in a 2-year study. Caries arrest fraction for SDF was 725% higher in a 24-month study and 100% greater than the placebo in a 30-month study. Besides, no serious adverse effects were reported.<sup>62</sup>

Furthermore, some evidence in the literature indicates that SDF varnishes seem to be efficacious in decreasing the initiation of root caries.<sup>61,63</sup> Few researchers recommend the application of SDF in managing pain and dentin sensitivity associated with root caries.<sup>64</sup> Japanese Society of Gerodontology, in 2019, suggested SDF as a successful agent in slowing the progress of root caries in individuals who have trouble availing or receiving dental treatment, such as bedridden patients and patients with dementia. Clinical Practice Guideline for Caries Treatment, published in 2015 by the Department of Conservative Dentistry, suggested SDF can prevent the progression of root caries.<sup>65</sup>

Dental caries in the elderly population in India is quite prevalent, including the aged community of the tribal groups. The 65-74-year-old age cohort has an 84% caries prevalence and the greatest DMFT of 7.01.<sup>66</sup> As

a result, there is a need to address the community's dental caries issue of the aged population across the country. Simple measures such as excellent oral hygiene and SDF applications can readily avoid dental caries and its complications.

Based on these findings, the researchers recommend SDF application only, or a combination of education and motivation, and other dental services for the older population having an elevated risk of developing root caries.

## **7. SDF as a Non-aerosol Treatment Option for Dental Caries: An Edge in Pandemic**

Owing to the ongoing worldwide pandemic of COVID-19, the World Health Organization has advised dental facilities to limit aerosol-generating activities.<sup>32,67</sup> Routine dental caries treatments usually involve the production of aerosols full of patient's blood and salivary elements. However, SDF is a non-aerosol-generating treatment option.<sup>68</sup> The clinicians commonly use a micro brush to apply SDF after drying the carious lesion with cotton. Therefore, SDF can be a safe preference for treating caries during similar conditions in future to minimise aerosol production and the risk of bacterial and viral transmission in dental clinics.<sup>32</sup>

## **8. SDF Inclusion in Community Dental health Services in the Indian set-up**

In India, dental or oral illness-pertinent spending is much less, possibly among the lowest worldwide. According to 2015 statistics, the average Indian expenditure on dental issues treatments per capita in US dollars was 0.14 (Rs. 8.45, given 1 USD is Rs. 65.00), as opposed to USD 370.47 for the United States of America. It is because of not availing dental services rather than a low incidence of oral illnesses.<sup>69</sup> Even though dentistry is an integral part of primary health services in India, expert dental services are available in a handful of districts at the primary health care level. In the cities, the ratio of dentist-to-population is 1:10,000, while it declines significantly to 1:150,000 in rural regions. Patients have no insurance coverage and pay for dental treatments from both government and private dental clinics out of their resources.<sup>70</sup> The WHO has been advocating for the inclusion of basic oral healthcare services into the presently functional primary healthcare level to benefit underserved and underprivileged communities, which may be effective in India, where there is a lack of sufficient dental experts in rural areas. Although India has robust Primary Health care and sub-centre systems, oral healthcare services are insufficient in remote regions. In India, Accredited Social Health Activists (ASHAs) and Anganwadi workers have a role in raising oral health awareness and increasing dental care utilisation. If suitable training is provided, these workers can be involved in SDF application at the Community level, especially in areas

where dental care services are poor.<sup>71,72</sup>

A pulling factor in oral health care is dental insurance. According to publicly available information, individuals with dental insurance avail dental care more repeatedly than those without. Many general health insurance policies have been implemented effectively in India over the years, but only a few dental insurance programmes have been launched. Also, most dental insurance does not cover preventive dental therapies. Furthermore, government-sponsored initiatives for dental care are minimal.<sup>73</sup> There is a dire need for an effective and practical national oral health policy to ensure that all sections of society benefit and that private dental practitioners are a part of this venture. The Indian Dental Association (IDA) frequently encourages its experienced members to contribute to community activities. The philosophy is to provide the best possible treatment for the underprivileged. It would not be possible without the help of private practitioners. The Dentists involved in solo dental practices should engage in community health initiatives and handle existing health disparities by meeting the health requirements of their community.<sup>74</sup> Including SDF in caries management inventory can help reduce dental care expenses since the SDF material costs about \$0.91/patient which is approximately 75 INR. Currently, we have around 67 government and 324 private dental colleges in India, according to the recent Dental Council of India (DCI) report.<sup>75</sup> SDF application should also become a part of the undergraduate clinical curriculum. Based on these considerations, if every college adopts one rural area, SDF can easily reach the community level and we can effectively control dental caries.

## 9. Conclusion

Untreated caries in young children continue to be a clinical and public health challenge and impacts children's health and quality of life. Therefore, there is an urgent need for trained staff and assets to fund, and endorse affordable, preventive measures such as SDF applications at a large - level for improving oral health quality globally.

## 10. Source of Funding

None.

## 11. Conflict of Interest


None.


## References

1. Qin X, Zi H, Zeng X. Changes in the global burden of untreated dental caries from 1990 to 2019: A systematic analysis for the Global Burden of Disease study. *Heliyon*. 2022;8(9):e10714.
2. Giacaman RA, Sandoval CM, Neuhaus KW, Fontana M, Chafas R. Evidence- based strategies for the minimally invasive treatment of carious lesions: review of the literature. *Adv Clin Exp Med*. 2018;27(7):1009–16.
3. Fleming E, Afful J. Prevalence of total and untreated dental caries among youth: United States. *NCHS Data Brief*. 2018;307:1–8.
4. Bali RK, Mathur VB, Talwar PP, Channa H. Dental Council of India; New Delhi: National Oral Health Survey & Fluoride Mapping; 2002. Available from: <https://dciindia.gov.in/>.
5. Sultan A, Mehta A, Juneja A, Siddiqui M. Evaluating parental acceptance for silver diamine fluoride therapy-a pilot study. *RSBO. Revista Sul-Brasileira de Odontologia*. 2020;17(2):1–4.
6. Phantumvanit P, Makino Y, Ogawa H, Gunn AR, Moynihan P, Petersen PE. WHO global consultation on public health intervention against early childhood caries. *Community Dent Oral*. 2018;46(3):280–7.
7. Devan I, Ramanarayanan V, Janakiram C. Prevalence of early childhood caries in India: A systematic review and meta-analysis. *Indian J Public Health*. 2022;66:3–11.
8. Bernabe E, Marcenes W, Hernandez CR, Bailey J, Abreu LG, Alipour V. Global, regional, and national levels and trends in burden of oral conditions from 1990 to 2017: a systematic analysis for the global burden of disease 2017 study. *J Dent Res*. 2020;99(4):362–73.
9. Horst JA. Silver fluoride as a treatment for dental caries. *Adv Dent Res*. 2018;29(1):135–40.
10. Peres MA, Macpherson LMD, Weyant RJ. Oral diseases: a global public health challenge. *Lancet*. 2019;394(10194):249–60.
11. Çolak H, Dülgergil Ç, Dalli M, Hamidi MM. Early childhood caries update: a review of causes, diagnoses, and treatments. *J Nat Sci Biol Med*. 2013;4(1):29–38.
12. Schwendicke F, Dörfer CE, Schlattmann P, Page LF, Thomson WM, Paris S. Socioeconomic inequality and caries: a systematic review and meta-analysis. *J Dent Res*. 2015;94(1):10–8.
13. Kastenbom L, Falsen A, Larsson P, Grönberg KS, Davidson T. Costs and health-related quality of life in relation to caries. *BMC Oral Health*. 2019;19(1):187. doi:10.1186/s12903-019-0874-6.
14. Ramos-Gomez FJ, Weintraub JA, Gansky SA, Hoover CI, Featherstone JD. Bacterial, behavioral and environmental factors associated with early childhood caries. *J Clin Pediatr Dent*. 2002;26(2):165–73.
15. Oral Health in America: A Report of the Surgeon General; 2000. Available from: <https://www.nidcr.nih.gov/sites/default/files/2017-10/hck1ocv.%40www.surgeon.fullrpt.pdf>.
16. Bridge G, Martel AS, Lomazzi M. Silver Diamine Fluoride: Transforming Community Dental Caries Program. *Int Dent J*. 2021;71(6):458–61.
17. Fonseca MD, Avenetti D. Social determinants of Pediatric oral health. *Dent Clin*. 2017;61(3):519–32.
18. Haworth S, Dudding T, Thomas WA, Timpson SJ. Ten years on: Is dental general anaesthesia in childhood a risk factor for caries and anxiety? *British Dent J*. 2017;222(4):299–304.
19. Kalra G, Bansal K, Sultan A. Prevalence of Early Childhood Caries and Assessment of its Associated Risk Factors in Preschool Children of Urban Gurgaon. *Indian J Dent Sci*. 2011;3(2):12–6.
20. Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader MJ, Bramlett MD. Influences on children's oral health: a conceptual model. *Pediatrics*. 2007;120(3):510–20.
21. Arachchige AL, Sultan A, Herath C. Silver diamine fluoride for early childhood caries- A boon for dentists during COVID-19 pandemic. *Int J Oral Health Dent*. 2021;7(3):161–5.
22. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. *J Dental Sci*. 2020;15(4):564–7.
23. Liu C, Zhang S, Zhang C, Tai B, Jiang H, Du M. The impact of coronavirus lockdown on oral healthcare and its associated issues of pre-schoolers in China: an online cross-sectional survey. *BMC Oral Health*. 2021;21(54):1–6.
24. Promoting oral health through fluoride: Adopted by the FDI General Assembly. *Int Dent J*. 2017;68(1):9378932.
25. Petersen PE, Ogawa H. Prevention of dental caries through the use of fluoride- the WHO approach. *Commun Dent Health*. 2016;33(2):66–74.
26. Beck MS, Gadbury-Amyot CC, Ferris H. Extending oral health care services to underserved children through a school-based collaboration:

- part 1: a descriptive overview. *J Dent Hyg.* 2011;85(3):181–92.
27. Mueller KJ, Mackinney AC, Gutierrez M, Richgels J. Place-based policies: The road to healthy rural people and places. Columbia, MO: Rural Policy Research Institute; 2011. Available from: <https://www.ruralhealthresearch.org/publications/816>.
  28. Clarkson BH, Exterkate RA. Non-invasive dentistry: a dream or reality? *Caries Res.* 2015;49(1):11–7.
  29. Chu CH, Mei ML, Lo EC. Use of fluorides in dental caries management. *Gen Dent.* 2010;58(1):37–80.
  30. Sultan A, Juneja A, Siddiqui M, Kaur G. Silver diamine fluoride as a proactive anti- caries tool: A review. *Int J Oral Health Dent.* 2019;5(2):63–71.
  31. Chu CH, Lo EC. Promoting caries arrest in children with silver diamine fluoride: a review. *Oral Health Prev Dent.* 2008;6(4):315–21.
  32. Gao SS, Amarquaye G, Arrow P, Bansal K, Bedi R, Campus G, et al. Global Oral Health Policies and Guidelines: Using Silver Diamine Fluoride for Caries Control. *Front. Oral Health.* 2021;2:685557. doi:10.3389/froh.2021.685557.
  33. Rural urban distribution of population. Provisional population totals. Available from: [http://censusindia.gov.in/2011-prov-results/paper2/data\\_files/india/Rural\\_Urban\\_2011.pdf](http://censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural_Urban_2011.pdf).
  34. American Academy of Pediatric Dentistry; Policy on the Use of Silver Diamine Fluoride for Pediatric Dental Patients; 2018. Available from: [https://www.aapd.org/media/Policies\\_Guidelines/P\\_SilverDiamine.pdf](https://www.aapd.org/media/Policies_Guidelines/P_SilverDiamine.pdf).
  35. Niederman N, Feres M. Essential Surgery. vol. 1; 2015. p. 173–95.
  36. Ruff RR, Niederman R. Comparative effectiveness of school-based caries prevention: a prospective cohort study. *BMC Oral Health.* 2018;18(1):53. doi:10.1186/s12903-018-0514-6.
  37. Prevention and control of tooth decay in kindergarten children; 2022. Available from: [http://facdent.hku.hk/docs/2013/KG\\_Leaflet\\_EnglishVersion.pdf](http://facdent.hku.hk/docs/2013/KG_Leaflet_EnglishVersion.pdf). Accessed.
  38. Chen KJ, Gao SS, Duangthip D, Ecm LO, Chu CH. Early childhood caries and oral health care of Hong Kong preschool children. *Clin CosmetInvestig Dent.* 2019;11:27–35.
  39. Fung MHT, Duangthip D, Wong MCM. Randomized clinical trial of 12% and 38% silver diamine fluoride treatment. *J Dent Res.* 2018;97(2):171–8.
  40. Duangthip D, Wong MCM, Chu CH, Lo ECM. Caries arrest by topical fluorides in preschool children: 30-month results. *J Dent.* 2018;70:74–9. doi:10.1016/j.jdent.2017.12.013.
  41. Roberts-Thomson KF, Ha DH, Wooley S, Meihubers S, Do LG. Community trial of silver fluoride treatment for deciduous dentition caries in remote Indigenous communities. *Australian Dent J.* 2019;64(2):175–80.
  42. Schuch HS, Haag DG, Kapellas K, Arantes R, Peres MA, Thomson WM. The magnitude of Indigenous and non-Indigenous oral health inequalities in Brazil, New Zealand and Australia. *Commun Dent Oral Epidemiol.* 2017;45(5):434–75.
  43. Spencer A, Do L. Oral health of Australian children: The National Child Oral Health Study. Adelaide: University of Adelaide Press; 2016. p. 370.
  44. Moffat SM, Thomson LA. New Zealand's School Dental Service over the Decades: Its Response to Social, Political, and Economic Influences, and the Effect on Oral Health Inequalities. *Front Public Health.* 2017;5:177.
  45. Narain JP. Health of tribal populations in India: How long can we afford to neglect? *Indian J Med Res.* 2019;149(3):313–6.
  46. Jamieson LM, Armfield JM, Roberts-Thomson KF. Indigenous and non-indigenous child oral health in three Australian states and territories. *Ethn Health.* 2007;12(1):89–107.
  47. Nath S, Poirier B, Ju F, Kapellas X, Haag K. Dental Health Inequalities among Indigenous Populations: A Systematic Review and Meta-Analysis. *Caries Res.* 2021;55(4):268–87.
  48. Tiwari T, Jamieson L, Broughton J, Lawrence HP, Batliner TS, Arantes R. Reducing Indigenous Oral Health Inequalities: A Review from 5 Nations. *J Dent Res.* 2018;97(8):869–77.
  49. Williams DM, Mossey PA, Mathur MR. Leadership in global oral health. *J Dent.* 2019;87:49–54.
  50. Janakiram C, Antony B, Joseph J. Association of undernutrition and early childhood dental caries. *Indian Pediatr.* 2018;55(8):683–5.
  51. Janakiram C, Ramanarayanan V, Devan I. Effectiveness of Silver Diamine Fluoride Applications for Dental Caries Cessation in Tribal Preschool Children in India: Study Protocol for a Randomized Controlled Trial. *Methods Protoc.* 2021;4(2):30. doi:10.3390/mps4020030.
  52. Sutton P. The politics of suffering: Indigenous Australia and the end of the liberal consensus. and others, editor; 2011. p. 81–3.
  53. Frencken J, Holmgren CJ. The atraumatic restorative treatment (ART) for tooth decay: a global initiative 1990-2000: final report and recommendations. *Clin Oral Investig.* 2012;16(5):1337–46.
  54. Nelson T, Scott JM, Crystal YO, Berg JH, Milgrom P. Silver Diamine Fluoride in Pediatric Dentistry Training Programs: Survey of Graduate Program Directors. *Pediatr Dent.* 2016;38(3):27306245–27306245.
  55. Health Insurance General Office of Mongolia; 2020. Available from: <https://www.oecd.org/countries/mongolia/42227662.pdf>.
  56. Chan AKY, Tamrakar M, Jiang CM, Lo ECM, Leung KCM, Chu CH. A systematic review on caries status of older adults. *Int J Environ Res Public Health.* 2021;18(20):10662.
  57. Griffin SO, Jones JA, Brunson D, Griffin PM, Bailey WD. Burden of oral disease among older adults and implications for public health priorities. *Am J Public Health.* 2012;102(3):411–8.
  58. Chikte U, Pontes CC, Karangwa I, Dhansay FK, Erasmus R, Kengne AP. Randomized clinical trial on arresting dental root caries through silver diamine fluoride applications in community-dwelling elders. *Int Dent J.* 2016;70:15–20.
  59. Li R, Lo ECM, Liu BY, Wong MCM, Chu CH. Randomized clinical trial on arresting dental root caries through silver diamine fluoride applications in community-dwelling elders. *J Dentistr.* 2016;51:15–20.
  60. Department of Health Oral Health Survey; 2011. Available from: <https://www.who.int/publications/i/item/9789241548649>.
  61. Zhang W, Mcgrath C, Lo E. Silver Diamine Fluoride and Education to Prevent and Arrest Root Caries among Community-Dwelling Elders. *Caries Res.* 2013;47(4):284–90.
  62. Hendre AD, Taylor GW, Chavez EM. A systematic review of silver diamine fluoride: effectiveness and application in older adults. *Gerodontology.* 2017;34(4):411–20.
  63. Tan HP, Lo EC, Dyson JE. A randomized trial on root caries prevention in elders. *J Dent Res.* 2010;89(10):1086–90.
  64. Castillo JL, Rivera S, Aparicio T. The short-term effects of diamine silver fluoride on tooth sensitivity: a randomized controlled trial. *J Dent Res.* 2011;90(2):203–11.
  65. Momoi Y, Hayashi M, Fujitani M, Fukushima M, Imazato S, Kubo S. Clinical guidelines for treating caries in adults following a minimal intervention policy- evidence and consensus-based report. *J Dent.* 2012;40(2):95–105.
  66. Janakiram C, Joseph AB, Ramanarayanan J. Prevalence of dental caries in India among the WHO index age groups: A meta-analysis. *J Clin Diagn Res.* 2018;12:8–13.
  67. World Health Organisation. COVID-19 strategy update; 2020. Available from: <https://www.who.int/docs/default-source/coronavirus/covid-strategy-update-14April2020.pdf>.
  68. Eden E, Frencken J, Gao S, Horst JA, Innes N. Managing dental caries against the backdrop of COVID-19: approaches to reduce aerosol generation. *Br Dent J.* 2020;229(7):411–7.
  69. Balaji SM. Economic impact of dental caries in India. *Indian J Dent Res.* 2018;29(2):132.
  70. Tandon S. Challenges to the oral health workforce in India. *J Dent Educ.* 2004;68:28–33.
  71. Khoisnam D, Pooja M, Reddy L, Goutham BS, Saha S. Utilization of Dental Health-Care Services by Accredited Social Health Activist and Anganwadi Workers in Lucknow District: A Cross-Sectional Study. *J Indian Assoc Pub Health Dent.* 2022;20(3):252–6.
  72. Vundavalli S. Dental manpower planning in India: Current scenario and future projections for the year 2020. *Int Dent J.* 2014;64:62–9.

73. Suri V, Bansal M, Kalra T. Dental Health Insurance in India: Need of the Hour! *Int Healthcare Res J*. 2017;1(9):265–9.
74. Community service; 2023. Available from: [https://en.wikipedia.org/wiki/Community\\_service](https://en.wikipedia.org/wiki/Community_service).
75. Mathur S, Sultan A, Aggarwal P, Nangia T, Juneja A. An Assessment of Understanding and Perspectives of BDS Undergraduate Students Related to Child Abuse and Neglect in an Indian Setup: A Questionnaire-Based Study. *Archives of Medicine and Health Sciences*. 2023;11(1):49–59.

**Akanksha Juneja**, Professor  <https://orcid.org/0000-0003-4127-1133>

**Maryam Siddiqui**, Assistant Professor  <https://orcid.org/0000-0003-2819-4567>

**Gurvinder Kaur**, Pediatric Dentist  <https://orcid.org/0000-0002-6646-7127>

## Author biography

**Amina Sultan**, Professor  <https://orcid.org/0000-0001-5245-4416>

**Cite this article:** Sultan A, Juneja A, Siddiqui M, Kaur G. Feasibility of community-based silver diamine fluoride (SDF) initiatives for dental caries control: An Indian perspective. *Arch Dent Res* 2023;13(2):69-76.