

Review article

Clinical use of silver diamine fluoride in older adults: A scoping review

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ABSTRACT

Background: Silver diamine fluoride (SDF) is widely recognized for managing early childhood caries, but its efficacy and applications in older adults remain understudied.**Objectives:** This scoping review synthesizes current clinical evidence on SDF's effectiveness in improving oral health outcomes among adults aged 65 years or older.**Data/Sources:** Two independent researchers systematically searched Embase, PubMed, Scopus, and Web of Science for English-language clinical studies (through June 30, 2025) assessing SDF's effects on oral health in older adults.**Study Selection/Results:** Nine clinical studies were included, evaluating SDF's impact on dental caries, gingival inflammation, and dentine hypersensitivity. Seven studies focused on caries management. Two controlled trials demonstrated SDF's effectiveness in arresting root caries, while three trials explored prevention, with two reporting significant efficacy. A single-arm trial reported an 86 % root caries arrest rate, and a retrospective study found 45 % of SDF-treated lesions remained arrested after 24 months. One controlled trial reported 59 % reduction in plaque accumulation and 67 % reduction in gingival inflammation with SDF. Another controlled trial demonstrated SDF outperformed potassium nitrate in alleviating hypersensitivity by 10 %.**Conclusions:** SDF demonstrates potential for improving oral health in older adults, particularly in arresting and preventing caries, reducing plaque, and managing hypersensitivity. However, the evidence base remains limited, highlighting the need for rigorous clinical trials to establish long-term outcomes, safety profiles, and optimized protocols for this population.**Clinical Significance:** This review underscores SDF's promise in geriatric dental care and identifies critical research priorities, including long-term efficacy, adverse effects, and age-specific treatment protocols.

1. Introduction

Silver diamine fluoride (SDF) is a colorless, alkaline liquid agent containing silver, fluoride, and ammonia [1]. Its therapeutic effects are based on the antibacterial properties of silver ions and the remineralizing effects of fluoride ions [2]. SDF has been approved for clinical use in Japan since 1970s and was cleared by the US Food and Drug Administration as a desensitizing agent in 2014 [2,3]. Since then, SDF has been adopted in clinical practice for management of oral diseases, and numerous clinical trials have been conducted to evaluate its clinical effectiveness in improving oral health.

The application of SDF is a simple, non-invasive procedure that does not require anesthesia or drilling. It serves as a feasible alternative for restorative treatment, especially in children or other vulnerable population who have difficulties in understanding or cooperating with traditional dental procedures [4,5]. The application can be performed

without the standard dental clinical setting or equipment and can be carried out by non-dental personnel after brief training. This ease of application allows SDF to be used in community settings, improving access to dental care for people in remote areas or those with physical disabilities [6]. With an estimated cost of USD \$0.2 per year per person for biannual application, SDF is potentially an affordable solution for controlling oral diseases in many developing countries [7]. Recognizing these advantages, the World Health Organization has listed SDF as an essential medicine for arresting dental caries since 2021 [8].

In addition to children, SDF may also benefit older adults. Ageing often involves a decline in cognitive, sensory and physical abilities, along with an increased risk of chronic medical conditions [9]. Older adults may be medically compromised, cognitive declined and physically disabled, all of which heighten their susceptibility to oral diseases [9]. They may also have difficulties in understanding or co-operating traditional dental procedures that are straightforward for other adult

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age groups [10]. As universal health coverage does not include oral health care in many countries, retired older adults may encounter financial barriers to dental care [11,12]. In this context, a simple, non-invasive and cost-effective option like SDF therapy could be particularly valuable for this disadvantaged age groups.

The application of SDF in treating oral diseases has been widely studied in children and adolescents. Its effectiveness in controlling dental caries is well documented. A systematic review determined that SDF was effective in preventing dental caries in primary dentition with a prevented fraction of 78 % and 54 % when compared to placebo and fluoride varnish respectively at 24-month follow-up periods [13]. Another systematic review highlighted the potential of SDF for arresting early childhood caries with a success rate ranging from 79 % to 90 % [14]. The most frequently reported drawback was the black staining of arrested carious lesions along with occasional complaints of gingival pain, bleaching or swelling [15,16]. A case report involving an immunocompromised adolescent suggested that SDF may also help improve gingival health [17]. This indicated that SDF may have potential use for improving various oral health conditions beyond dental caries. In contrast to its use in children and adolescents, the clinical application of SDF in older adults has been scarcely discussed. Currently, the two systematic reviews on SDF use in older adults have focused solely on caries management, and the clinical use of SDF in addressing other oral conditions such as dentine hypersensitivity in this population remains unexplored [18,19].

Population ageing is a global public health concern. As the population ages, their oral health needs will bring unpredictable impact and burden on our healthcare system [20]. SDF presents a promising, simple, non-invasive, and inexpensive option for enhancing oral health among older adults. Having a better understanding of the clinical effectiveness of SDF in improving different oral conditions in this population, along with the possible adverse effects, would assist dental professionals and governments to adopt SDF into clinical practice and policy making. This scoping review aims to synthesize the current clinical evidence on the use of SDF to improve oral health in older adults. By consolidating the existing evidence, this review will identify the research gaps and provide guidance for further studies to optimize the application of SDF therapy for improving oral health in older adults.

2. Methods

This scoping review was conducted and reported following the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) Extension for Scoping Reviews (PRISMA-ScR) Checklist [21] (Supplementary materials). The review protocol was registered with Open Science Framework (Registration DOI: <https://doi.org/10.17605/OSF.IO/NDGQA>).

The research questions addressed in this review are:

- Which oral conditions in older adults can be improved by SDF?
- What is the current evidence supporting the clinical application of SDF for improving oral health in older adults?
- What potential adverse effects may result from SDF application in older adults?

2.1. Search strategy

Two researchers (AKC and SC) performed independent literature search for English publications on four electronic databases (Embase, PubMed, Scopus and Web of Science) using the keywords (“silver diamine fluoride” OR “Diammine silver fluoride” OR “Ammoniacal silver fluoride” OR “silver ammonia fluoride” OR “silver fluoride” OR “quaternary ammonium compounds” OR Saforide OR Rivastar OR “Advantage Arrest” OR Topamine OR e-SDF) AND (“older adults” OR elderly OR elders OR aged OR geriatrics). The final search was

conducted on 30th June 2025 without time limit. The full search strategy is presented in Supplementary materials.

2.2. Search selection and eligibility criteria

After removing duplicates, the two researchers independently screened and selected the titles and abstracts of the retrieved literature based on the inclusion criteria outlined in Table 1. Clinical studies that did not investigate the clinical application of SDF, oral health outcomes, or participants aged 65 or above as well as laboratory studies, surveys, animal studies, reviews, letters, editorials, conference abstracts, and study protocols were excluded. The full texts of the identified publications and those whose eligibility could not be determined from their titles or abstracts were further assessed for suitability. Manual citation searching of the included publications was conducted to identify any potential studies. The third researcher (CHC) was consulted regarding disagreements for the final decision.

2.3. Data extraction and analysis

The two researchers extracted the data independently using a Microsoft Excel spreadsheet and the third research (CHC) verified the data. The data included the first author’s name, publication year, study design, study duration, sample size, the participants’ characteristics (mean age, proportion of gender and living status), SDF agents (brand name, manufacturer, and concentration), frequency of SDF application, groupings, oral conditions investigated, clinical oral health outcomes, and the reported adverse effects.

2.4. Critical appraisal

No quality assessment has been performed in accordance with the PRISMA-ScR guidelines for scoping reviews.

3. Results

3.1. Study selection

A total of 1281 publications were identified from four electronic databases (613 from Scopus, 252 from Web of Sciences, 229 from PubMed and 187 from Embase). After removing 538 duplicates, the titles and abstracts of 743 publications were screened according to the inclusion and exclusion criteria. After screening, 720 publications were excluded due to studies conducted on children, studies not investigated oral health outcomes, in vitro studies or reviews.

The full texts of the remaining 23 publications were retrieved and assessed. Fourteen publications were further excluded due to studies conducted on participants with a mean age <65 ($n = 11$), surveys ($n = 2$), and in vitro study ($n = 1$). Nine publications were included in this review for data extraction. No additional publications were identified in

Table 1
Inclusion criteria of SDF clinical studies on older adults.

Studies	Clinical studies including cross-sectional studies, clinical trials, cohort studies (prospective and retrospective), and case reports with post-intervention data
Participants	All aged 65 or above OR Mean age of 65 or above
Intervention/Control	Silver diamine fluoride therapy
Outcome	1. Measurable/quantitative oral health outcome including caries (number of new/arrested carious lesions, prevented fraction, or arrested rate), periodontal health outcome (plaque index, gingival index, or clinical attachment loss), degree of dentine hypersensitivity (visual analog scale or sensitivity score) etc. OR 2. Adverse effects

the reference lists of the included publications. The two independent researchers extracted data with 97 % agreement. Fig. 1 depicts the flowchart of the literature search.

3.2. Study characteristics

Among the nine clinical studies included in this review, seven were randomized clinical trials, one was a case series, and one was a retrospective cohort study. Six studies involved community-dwelling older adults whereas the remaining three focused on older adults who lived in nursing homes [22,23] or retirement homes [24]. The participants' mean age ranged from 70 ± 3 to 88 ± 6 . Seven studies investigated the effectiveness of SDF on dental caries management, one explored the SDF application on plaque accumulation and gingival inflammation, and one tested the desensitizing effects of SDF application. The frequency of SDF application varied across studies. Those targeting dental caries management typically employed annual SDF application, whereas those evaluating other oral conditions utilized weekly or monthly application. Table 2 summarizes the characteristics and findings of the included

clinical studies.

3.3. Oral health outcome

Seven of the included studies explored the use of SDF for dental caries management in older adults. Three randomized clinical studies investigated the preventive effect of SDF on root caries [23,25,26]. Compared to placebo, two studies found a significant more reduction in the mean number of new root caries surfaces in older adults who received SDF [23,25], while one study did not detect any significant difference [26]. The prevented fraction of SDF application ranged from 25 % to 71 %. Additionally, two randomized clinical trials assessed the caries arrest effect of SDF on root caries, reporting higher mean number of arrested root caries lesions in the SDF group than placebo group [26, 27]. The caries arrest rates of SDF application were 24 % and 90 %. One study examined the synergistic effects of SDF on a risk-based caries prevention program but found no additional benefit [22]. Furthermore, two single-group studies reported 86 % root caries arrest rate, 87 % crown margin caries arrest rate, 100 % furcal caries arrest rate and 45 %

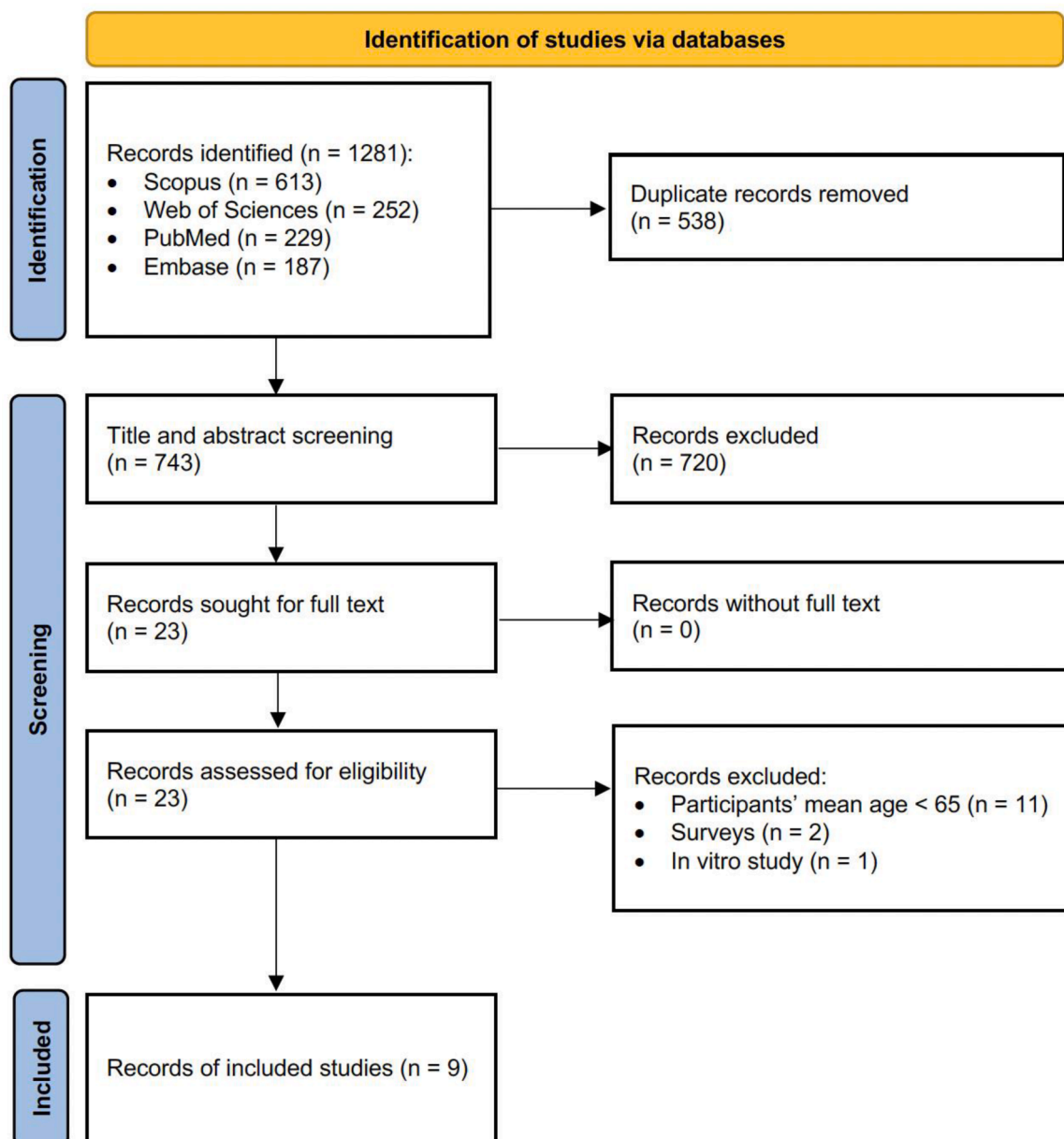


Fig. 1. The flowchart of the literature search of clinical use of silver diamine fluoride in older adults.

Table 2
Summary of the included clinical studies on silver diamine fluoride.

Study Design (Ref)	Living status, Sample size, age	Period, Application frequency	Intervention Group (Gp)	Main Findings
<i>Management of Dental caries</i>				
Randomized clinical trial [22]	Institutionalized 356, 88 ± 6	12 months Annual	Gp 1 SDF Gp 2 Water	No significant difference in root caries status
Randomized clinical trial [23]	Institutionalized 306, 79 ± 6	36 months Annual	Gp 1 OHI Gp 2 SDF	New carious surfaces: Gp 1 > Gp 2 Prevented fraction: Gp 2: 71 %
Randomized clinical trial [25]	Community 323, 72 ± 6,	30 months Annual	Gp 1 Water Gp 2 SDF Gp 3 SDF + KI	New root caries experience: Gp 1 > Gp 2,3 Prevented fraction: Gp 2: 62 %; Gp 3: 52 %
Randomized clinical trial [26]	Community 266, 73 ± 6	24 months Annual	Gp 1 OHI Gp 2 OHI+SDF Gp 3 OHI+SDF+OHE	New carious surfaces: Gp 1 > Gp 3 Prevented fraction: Gp 2: 25 %; Gp: 3 47 % Mean arrested surfaces: Gp 1 < Gp 2,3 Caries arrest rate: Gp 2 24 %; Gp 3 - 39 %
Randomized clinical trial [27]	Community 83, 72 ± 6	30 months Annual	Gp 1 Water Gp 2 SDF Gp 3 SDF + KI	Root caries arrest rate: Gp 1 < Gp 2,3 Caries arrest rate: Gp 2 90 %; Gp 3 93 %
Retrospective cohort trial [6]	Community 169, 65 to 104*	24 months Various	SDF	SDF-treated caries remained arrested: 45 %
Case series [28]	Community 62, 80 ± 7	18 months Semi-annual	SDF	Caries arrest rate: 86 % Caries arrest rate at crown margin: 87 %
<i>Management of Plaque accumulation and gingival inflammation</i>				
Randomized clinical trial [24]	Institutionalized 40, 70 ± 3	7 weeks, Weekly for 3 weeks	Gp 1 SDF Gp 2 Saline	Improvement in gingival response: Gp 1 67 %; Gp 2 no change (Gp 1 > Gp 2) Improvement in Oral Hygiene: Gp 1 59 %; Gp 2 no change (Gp 1 > Gp 2)
<i>Management of Dentine hypersensitivity</i>				
Randomized clinical trial [29]	Community 148, 73 ± 6	8 weeks, Monthly	Gp 1 SDF Gp 2 KNO ₃	Reduction in hypersensitivity: Gp 1 60 % > Gp 2 50 %

OHE: oral hygiene education; OHI: oral hygiene instruction; SDF: silver diamine fluoride; KI: potassium iodide (SSKI oral solution); KNO₃: Potassium nitrate; * Age range.

caries tooth survival rate after SDF applications [6,28]. In addition, two randomized clinical trials evaluated the effect of SDF on oral health conditions beyond dental caries [24,29]. Noureldin et al. reported a 59 % reduction in plaque accumulation and a 67 % reduction in gingival inflammation in older adults after SDF application [24]. Chan et al. found SDF effective to relieve dentine hypersensitivity on exposed root surfaces of older adults, with a 10 % greater reduction compared to potassium nitrate solution [29].

3.4. Reported adverse effects

Seven of the included studies assessed older adults’ perceptions, observable clinical changes, or other reported adverse effects after SDF application during the study period. No major harmful events had been reported. In studies where SDF was applied to multiple sites, participants reported transient unpleasant taste and mild odour after intervention [22,24]. Some changes in gingivae, such as colour alterations and mild ulcerations, were noted but all resolved in the follow-up visits [22]. Additionally, black stain on arrested root caries lesions was observed during follow-up assessments [25,27]. Table 3 presents the reported adverse effects after SDF application in the included studies.

4. Discussion

This is the first scoping review to provide an evidence-based summary on the clinical applications of SDF in older adults. It underscores the potential of SDF in improving oral health of older adults, particularly in caries prevention and arrest, plaque control and dentine hypersensitivity management. To date, no major harmful effects have been reported following SDF use on older adults. These findings support the

Table 3
Studies investigating adverse effects after silver diamine fluoride application.

Study	Reported adverse effects
Ericson et al., 2023 [22]	Whitish discolouration (3.2 %), redness (1.2 %) and mild ulceration (0.6 %) on gingivae; slight taste sensation (53 %); mild smell (0.03 %)
Noureldin et al., 2024 [24]	Unpleasant metallic taste (20 %)
Li et al., 2016 [27]	Blackening of arrested root caries lesions
Li et al., 2017 [25]	Black stain
Chan et al., 2023 [29]	No reported adverse effects; no post-treatment complaints;
Mitchell et al., 2021 [28]	No reported adverse effects
Tan et al., 2010 [23]	No reported adverse effects

adoption of SDF into geriatric dental care and community oral health promotion programs. Despite four electronic databases were used for the literature search, only nine clinical studies were included. It indicates the necessity for more clinical trials to explore the roles of SDF in promoting oral health in older adults.

4.1. Dental caries management

Seven clinical studies investigated the effectiveness of SDF on caries control in older adults. SDF possesses both bactericidal and remineralizing properties. It inhibits cariogenic bacteria growth, halts collagen degradation in dentin, reduces demineralization, and promotes remineralization [30]. Therefore, SDF has been used off-label for managing dental caries, especially early childhood caries, for decades [14]. Unlike

studies in children, these seven studies focused on the management of root caries lesions rather than coronal caries lesions. Root caries is the dominant type of dental caries in older adults due to the exposed root surface resulted from ageing or periodontal diseases [31,32]. Nearly half of the global older adult population suffered from untreated root caries [33].

Three randomized clinical studies assessed the preventive effect of SDF on root caries with the prevented fraction ranging from 25 % to 71 % [23,25,26]. One study detected a significant difference in the mean number of new root caries surfaces in institutionalized older adults between SDF and placebo groups [23]. Given the diverse medical, physical and functional conditions, caries risk varied widely among older adults [10]. Preventive measure effective in independent older adults may not be effective in institutionalized older adults with compromised medical condition or reduced self-care abilities [10]. This study suggests that SDF could be beneficial for preventing root caries in institutionalized settings.

The remaining two clinical trials involving community-dwelling older adults obtained inconsistent findings [25,26]. Zhang et al. did not observe any significant difference in the number of new root caries lesions between SDF and placebo groups but detected a significant reduction in new root caries in older adults who received a combination of SDF applications and a 6-month interval oral health education program [26]. This program involved personalized two-way interaction with a dental hygienist to promote oral health-related behaviour change [26]. This clinical trial implied that combining SDF with behavioural change intervention may augment its preventive effect in community settings.

Contemporary caries management emphasizes risk-based control at both patient- and tooth-levels [34]. Unlike institutionalized older adults with assisted oral hygiene practice and diet control, the caries risk control of community-dwelling older adults largely depends on their intention and abilities to modify their habits [34]. Various behavioural change models have shown promising results on enhancing oral health; however, most are designed for younger populations only [35–37]. Zhang et al. study supported the need for tailored behavioural change models for older adults to maximize the preventive effects of SDF on root caries in older adults.

Four studies investigated the caries arrest effect of SDF on root caries in community-dwelling older adults. Compared to placebo, two controlled studies found annual SDF application more effective in arresting root caries lesions with the caries arrest rates of 24 % and 90 % [26,27]. No controlled clinical trials have yet investigated the effectiveness of SDF in arresting dental caries in institutionalized older adults. The ease and non-invasiveness of SDF application make it suitable for caries control in vulnerable groups, such as uncooperative children or older adults with disabilities [38]. Further clinical evidence is essential to support its use in dependent older populations.

A case series reported the use of SDF in arresting root caries lesions around crown margins and furcation areas in older adults with the caries arrest rate of 87 % and 100 % respectively [28]. Root caries lesions at furcation areas or around crown margins may pose a challenge for operative work in older adults with reduced physical and functional capacities, leaving extraction as the only option [32]. This case series' findings presented SDF as a promising non-invasive alternative to manage these clinical scenarios in frail or institutionalized older adults.

While current evidence suggests that SDF can prevent and arrest root caries in older adults, it is uncertain whether if SDF may outperform other fluoride therapies, such as sodium fluoride varnish or high-dose fluoride toothpaste. Moreover, research suggests that the frequency of SDF application may influence its clinical effectiveness in caries arrest [15,39]; however, all included studies on root caries management in older adults implement annual SDF application protocol only. Conducting additional comparative studies between SDF and other treatment regimens, as well as examining different application frequencies, is essential to provide robust evidence for clinical decision-making and

policy development in improving oral health of older adults.

4.2. Aid in plaque control

One randomized clinical trial observed that SDF reduced plaque accumulation among older adults [24]. Since dental plaque plays an essential role in initiation and progression of periodontal diseases, older adults who received SDF also showed improvement on their gingival health condition [24,40]. Despite the mechanism on how SDF affects plaque accumulation remains unclear, it was believed that SDF may inhibit the growth and adhesion of periodontal pathogens, halting the plaque formation [24]. However, current in vitro studies on the antibacterial activities of SDF mainly focused on cariogenic bacteria, with limited data on periodontal pathogens like *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans* [41]. Future laboratory studies should explore the effect of SDF on other oral pathogens to widen the potential clinical use of SDF in older adults.

This trial was a pilot study, but it underscored the potential use of SDF in improving periodontal health in older adults [24]. Well-designed, long-term clinical trials are imperative to confirm its clinical efficacy in primary periodontal care for older adults. Plaque control is crucial to the success of periodontal treatment [42], however meticulous daily plaque removal practice may not be easy for older adults with reduced manual dexterity or impaired cognition [43,44]. Therefore, exploring SDF as an adjunct to periodontal therapy could improve the treatment outcomes in this vulnerable group.

4.3. Dentine hypersensitivity management

Although being cleared as a desensitizing agent, the use of SDF on dentine hypersensitivity management has not been widely studied [2, 45]. A randomized clinical trial demonstrated that SDF immediately reduced dentine hypersensitivity on exposed root surfaces in older adults [29]. The silver ions of SDF denatured and aggregated proteins whereas its fluoride ions formed deposits with calcium ions to occlude the exposed dentinal tubules [46,47]. Compared to potassium nitrate, SDF showed 10 % greater reduction in dentine hypersensitivity at 8-week follow-up periods. This trial affirmed the use of SDF as a professionally applied desensitizing agent in older adults, however clinical trials with longer follow-up periods are warranted to evaluate the durability of its desensitizing effects [48,49].

Dentine hypersensitivity is a common sequel of periodontal therapy due to exposed root surfaces after the resolution of gingival inflammation [50,51]. It induces discomfort, limits food choice, impacts daily oral hygiene practice and negatively affects the quality of life in older adults [52,53]. This sequel can significantly influence patients' perception of the care they received and their willingness to undergo treatment [54]. Until now, no standardized guidelines address post-operative dentine hypersensitivity of periodontal therapy. As SDF relieved dentine hypersensitivity on exposed root surface in older adults, its possible role in managing post-operative dentine hypersensitivity of periodontal therapy should be further studied.

4.4. Reported adverse effect

No major harmful events were reported after SDF application in the included clinical studies. SDF application can be considered as a safe clinical procedure for older adults. Similar to findings in paediatric populations, the major drawback of SDF therapy in older adults was the black staining of arrested caries lesions [16]. Unlike studies in children which primarily assessed parental satisfaction, older adults expressed concerns about the metallic taste and unpleasant smell following SDF application. Since SDF solution is watery and spread easily around the oral cavity, multiple-site applications may intensify the metallic sensation [55]. In one study, one-fifth of the older adults complained about the metallic taste when SDF solution was applied on all facial surfaces of

the dentition [24].

Regarding to the metallic taste of SDF solution, there is yet any suggestions for masking. Coating SDF solution with sodium fluoride varnish has been tried to mitigate the sensation, however the remineralizing and desensitizing properties of sodium fluoride varnish may affect the final findings of the clinical trials [28]. SDF gel with increased viscosity has recently been developed and may limit the spread of SDF gel within the oral cavity [55]. However, further research should examine whether if the change of viscosity may affect the therapeutic properties of SDF in older adults.

4.5. Strengths and limitations

This review employed a comprehensive and systematic literature search to retrieve a maximum number of publications with a 97 % agreement between two researchers. Only English-language publications were included to avoid translational errors, however it may exclude some relevant non-English studies from countries such as Japan, China, Brazil and Argentina, where SDF is widely used. Moreover, no grey literatures were included to standardize the search protocol between the researchers but could induce publication bias.

5. Conclusion

Silver diamine fluoride therapy shows promise for improving oral health in older adults, particularly for caries arrest and prevention, plaque control, and dentine hypersensitivity management. However, evidence remains limited, underscoring the need for well-designed clinical trials to guide its use in clinical practice and policy development for geriatric oral care.

CRediT authorship contribution statement

Alice Kit Ying Chan: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Stephanie Chu:** Writing – review & editing, Methodology, Formal analysis, Data curation. **Ollie Yiru Yu:** Writing – review & editing, Formal analysis. **Chun Hung Chu:** Writing – review & editing, Visualization, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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References

- [1] Y.O. Crystal, R. Niederman, Evidence-based dentistry update on silver diamine fluoride, *Dent. Clin. North Am.* 63 (2019) 45–68, <https://doi.org/10.1016/j.cden.2018.08.011>.
- [2] J.A. Horst, H. Ellenikiotis, P.L. Milgrom, UCSF protocol for caries arrest using silver diamine fluoride: rationale, indications and consent, *J. Calif. Dent. Assoc.* 44 (2016) 16–28.
- [3] R. Yamaga, Arrestment of caries of deciduous teeth with diamine silver fluoride, *Dental Outlook* 33 (1969) 1007–1013.
- [4] Y.O. Crystal, A.A. Marghalani, S.D. Ureles, J.T. Wright, R. Sulyanto, K. Divaris, M. Fontana, L. Graham, Use of silver diamine fluoride for dental caries management in children and adolescents, including those with special health care needs, *Pediatr. Dent.* 39 (2017) 135–145.
- [5] F. Arriola-Pacheco, K. Sihuay-Torres, E. Pynn, F. Mauro, B. Pynn, H.P. Lawrence, Dental professionals' Perceptions of silver diamine fluoride use for children and older adults in Northern Ontario, *J. Can. Dent. Assoc.* 91 (2025) 11.
- [6] K. Kettelkamp, J. Desai, S. Lewis, C. Connick, L. Marchini, Outcomes of silver diamine fluoride (SDF) treatment among older adults: a retrospective analysis, *Special Care in Dentistry* 45 (2025) e70013, <https://doi.org/10.1111/scd.70013>.
- [7] World Health Organization, Silver diamine fluoride – Electronic Essential Medicines List. <https://list.essentialmeds.org/recommendations/1231#:~:text=Silver%20diamine%20fluoride%20was%20considered,varies%20by%20manufaturer%20and%20market>, (accessed 11 July 2025).
- [8] World Health Organization, World Health Organization model list of essential medicines: 22nd list. <https://iris.who.int/bitstream/handle/10665/345533/WHO-MHP-HPS-EML-2021.02-eng.pdf?sequence=1>, 2021 (accessed 11 July 2025).
- [9] K. Fukai, S. Dartevelle, J. Jones, Oral Health for healthy ageing: a people-centred and function-focused approach, *Int. Dent. J.* 72 (2022) S2–s4, <https://doi.org/10.1016/j.identj.2022.06.001>.
- [10] I.A. Pretty, R.P. Ellwood, E.C. Lo, M.I. MacEntee, F. Müller, E. Rooney, W. M. Thomson, G.J. Van der Putten, E.M. Ghezzi, A. Walls, M.S. Wolff, The Seattle Care Pathway for securing oral health in older patients, *Gerodontology* 31 (2014) 77–87, <https://doi.org/10.1111/ger.12098>.
- [11] M.A. Peres, L.M.D. Macpherson, R.J. Weyant, B. Daly, R. Venturelli, M.R. Mathur, S. Listl, R.K. Celeste, C.C. Guarnizo-Herreño, C. Kearns, H. Benzian, P. Allison, R. G. Watt, Oral diseases: a global public health challenge, *Lancet* 394 (2019) 249–260, [https://doi.org/10.1016/S0140-6736\(19\)31146-8](https://doi.org/10.1016/S0140-6736(19)31146-8).
- [12] R.G. Watt, B. Daly, P. Allison, L.M.D. Macpherson, R. Venturelli, S. Listl, R. J. Weyant, M.R. Mathur, C.C. Guarnizo-Herreño, R.K. Celeste, M.A. Peres, C. Kearns, H. Benzian, Ending the neglect of global oral health: time for radical action, *Lancet* 394 (2019) 261–272, [https://doi.org/10.1016/S0140-6736\(19\)31133-X](https://doi.org/10.1016/S0140-6736(19)31133-X).
- [13] B.H. Oliveira, A. Rajendra, A. Veitz-Keenan, R. Niederman, The effect of silver diamine fluoride in preventing caries in the primary dentition: a systematic review and meta-analysis, *Caries Res.* 53 (2019) 24–32, <https://doi.org/10.1159/000488686>.
- [14] J. Schmoekel, K. Gorseta, C.H. Splieth, H. Juric, How to intervene in the caries process: early childhood caries - A systematic review, *Caries Res.* 54 (2020) 102–112, <https://doi.org/10.1159/000504335>.
- [15] D. Duangthip, M.C.M. Wong, C.H. Chu, E.C.M. Lo, Caries arrest by topical fluorides in preschool children: 30-month results, *J. Dent.* 70 (2018) 74–79, <https://doi.org/10.1016/j.jdent.2017.12.013>.
- [16] D. Duangthip, M.H.T. Fung, M.C.M. Wong, C.H. Chu, E.C.M. Lo, Adverse effects of silver diamine fluoride treatment among preschool children, *J. Dent. Res.* 97 (2018) 395–401, <https://doi.org/10.1177/0022034517746678>.
- [17] C.H. Chu, A.H. Lee, L. Zheng, M.L. Mei, G.C. Chan, Arresting rampant dental caries with silver diamine fluoride in a young teenager suffering from chronic oral graft versus host disease post-bone marrow transplantation: a case report, *BMC. Res. Notes.* 7 (2014), <https://doi.org/10.1186/1756-0500-7-3>.
- [18] A.D. Hendre, G.W. Taylor, E.M. Chávez, S. Hyde, A systematic review of silver diamine fluoride: effectiveness and application in older adults, *Gerodontology* 34 (2017) 411–419, <https://doi.org/10.1111/ger.12294>.
- [19] A.K.Y. Chan, M. Tamrakar, C.M. Jiang, Y.C. Tsang, K.C.M. Leung, C.H. Chu, Clinical evidence for professionally applied fluoride therapy to prevent and arrest dental caries in older adults: a systematic review, *J. Dent.* 125 (2022) 104273, <https://doi.org/10.1016/j.jdent.2022.104273>.
- [20] P.E. Petersen, H. Ogawa, Promoting oral health and quality of life of older people - the need for public health action, *Oral Health N Hav Prev Dent* 16 (2018) 113–124, <https://doi.org/10.3290/j.ohpd.a40309>.
- [21] A.C. Tricco, E. Lillie, W. Zarin, K.K. O'Brien, H. Colquhoun, D. Levac, D. Moher, M. D.J. Peters, T. Horsley, L. Weeks, S. Hempel, E.A. Akl, C. Chang, J. McGowan, L. Stewart, L. Hartling, A. Aldcroft, M.G. Wilson, C. Garritty, S. Lewin, C. M. Godfrey, M.T. Macdonald, E.V. Langlois, K. Soares-Weiser, J. Moriarty, T. Clifford, O. Tunçalp, S.E. Straus, PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation, *Ann. Intern. Med.* 169 (7) (2018) 467–473, <https://doi.org/10.7326/M18-0850>.
- [22] D. Ericson, P. Carlsson, P. Gabre, I. Wårdh, M. Zimmerman, P. Sjögren, Effect of a single application of silver diamine fluoride on root caries after 12 months in institutionalised older adults—A randomised clinical trial, *Gerodontology* 40 (2023) 390–397, <https://doi.org/10.1111/ger.12668>.
- [23] H.P. Tan, E.C.M. Lo, J.E. Dyson, Y. Luo, E.F. Corbet, A randomized trial on root caries prevention in elders, *J. Dent. Res.* 89 (2010) 1086–1090, <https://doi.org/10.1177/0022034510375825>.
- [24] A. Noureldin, W. Alshehri, H. Tapias, L. Mallonee, L.M. Mancl, P. Milgrom, K. Svoboda, Efficacy of 38% silver diamine fluoride in reducing gingival inflammation and plaque accumulation in older adults living in retirement-homes: a randomized controlled pilot trial, *J. Dent.* 143 (2024) 104890, <https://doi.org/10.1016/j.jdent.2024.104890>.
- [25] R. Li, E.C.M. Lo, B.Y. Liu, M.C.M. Wong, C.H. Chu, Randomized clinical trial on preventing root caries among community-dwelling elders, *JDR. Clin. Trans. Res.* 2 (2017) 66–72, <https://doi.org/10.1177/2380084416668491>.
- [26] W. Zhang, C. McGrath, E.C.M. Lo, J.Y. Li, Silver diamine fluoride and education to prevent and arrest root caries among community-dwelling elders, *Caries Res.* 47 (2013) 284–290, <https://doi.org/10.1159/000346620>.
- [27] R. Li, E.C.M. Lo, B.Y. Liu, M.C.M. Wong, C.H. Chu, Randomized clinical trial on arresting dental root caries through silver diamine fluoride applications in

- community-dwelling elders, *J. Dent.* 51 (2016) 15–20, <https://doi.org/10.1016/j.jdent.2016.05.005>.
- [28] C. Mitchell, A.J. Gross, P. Milgrom, L. Mancil, D.B. Prince, Silver diamine fluoride treatment of active root caries lesions in older adults: a case series, *J. Dent.* 105 (2021) 103561, <https://doi.org/10.1016/j.jdent.2020.103561>.
- [29] A.K.Y. Chan, Y.C. Tsang, C.M. Jiang, K.C.M. Leung, E.C.M. Lo, C.H. Chu, Treating hypersensitivity in older adults with silver diamine fluoride: a randomised clinical trial, *J. Dent.* 136 (2023) 104616, <https://doi.org/10.1016/j.jdent.2023.104616>.
- [30] A.C. Amorim, A.J.D. Carvalho, M.S.A. Carvalho, M.C. Ferreira, V.R. Novais, Effects of silver diamine fluoride in human dentin: a systematic review of in vitro studies, *Eur. J. Oral Sci.* (2025) e70023, <https://doi.org/10.1111/eos.70023>.
- [31] L. Al-Nasser, I.B. Lamster, Prevention and management of periodontal diseases and dental caries in the older adults, *Periodontol.* 2000 84 (2020) 69–83, <https://doi.org/10.1111/prd.12338>.
- [32] S. Paris, A. Banerjee, P. Bottenberg, L. Breschi, G. Campus, S. Doméjean, K. Ekstrand, R.A. Giacaman, R. Haak, M. Hannig, R. Hickel, H. Juric, A. Lussi, V. Machiulskiene, D. Manton, A. Jablonski-Momeni, R. Santamaria, F. Schwendicke, C.H. Splieth, H. Tassery, A. Zandoni, D. Zero, S. Zimmer, N. Opdam, How to intervene in the caries process in older adults: a joint ORCA and EFCD expert Delphi consensus statement, *Caries Res.* 54 (2020) 1–7, <https://doi.org/10.1159/000510843>.
- [33] A.K.Y. Chan, M. Tamrakar, C.M. Jiang, E.C.M. Lo, K.C.M. Leung, C.H. Chu, A systematic review on caries status of older adults, *Int J Environ Res Public Health* N Hav 18 (2021) 10662, <https://doi.org/10.3390/ijerph182010662>.
- [34] J.D.B. Featherstone, Y.O. Crystal, P. Alston, B.W. Chaffee, S. Doméjean, P. Rechmann, L. Zhan, F. Ramos-Gomez, Evidence-based caries management for all ages-practical guidelines, *Front Oral Health N Hav* 2 (2021) 657518, <https://doi.org/10.3389/froh.2021.657518>.
- [35] C.C.K. Chan, A.K.Y. Chan, C.H. Chu, Y.C. Tsang, Theory-based behavioral change interventions to improve periodontal health, *Front Oral Health N Hav* 4 (2023) 1067092, <https://doi.org/10.3389/froh.2023.1067092>.
- [36] X. Gao, E.C. Lo, S.C. Kot, K.C. Chan, Motivational interviewing in improving oral health: a systematic review of randomized controlled trials, *J. Periodontol.* 85 (2014) 426–437, <https://doi.org/10.1902/jop.2013.130205>.
- [37] C.J. Moores, A.M. Taylor, S. Cowap, R. Roberts, K. Gunasinghe, P.J. Moynihan, Behavior change techniques to reduce sugars intake by adolescents: a systematic review, *JDR. Clin. Trans. Res.* 10 (2025) 227–245, <https://doi.org/10.1177/23800844241280717>.
- [38] G. Bridge, A.S. Martel, M. Lomazzi, Silver diamine fluoride: transforming community dental caries program, *Int. Dent. J.* 71 (2021) 458–461, <https://doi.org/10.1016/j.identj.2020.12.017>.
- [39] M.H.T. Fung, D. Duangthip, M.C.M. Wong, E.C.M. Lo, C.H. Chu, Randomized clinical trial of 12% and 38% silver diamine fluoride treatment, *J. Dent. Res.* 97 (2018) 171–178, <https://doi.org/10.1177/0022034517728496>.
- [40] I.L. Chapple, F. Van der Weijden, C. Doerfer, D. Herrera, L. Shapira, D. Polak, P. Madianos, A. Louropoulou, E. Machtei, N. Donos, H. Greenwell, A.J. Van Winkelhoff, B. Eren Kuru, N. Arweiler, W. Teughels, M. Aimetti, A. Molina, E. Montero, F. Graziani, Primary prevention of periodontitis: managing gingivitis, *J. Clin. Periodontol.* 42 (2015) S71–S76, <https://doi.org/10.1111/jcpe.12366>.
- [41] M.L. Mei, Q.L. Li, C.H. Chu, E.C. Lo, L.P. Samaranayake, Antibacterial effects of silver diamine fluoride on multi-species cariogenic biofilm on caries, *Ann. Clin. Microbiol. Antimicrob.* 12 (2013) 4, <https://doi.org/10.1186/1476-0711-12-4>.
- [42] M. Sanz, D. Herrera, M. Kebschull, I. Chapple, S. Jepsen, T. Beglundh, A. Sculean, M.S. Tonetti, EFP workshop participants and methodological consultants, treatment of stage I-III periodontitis-the EFP S3 level clinical practice guideline, *J. Clin. Periodontol.* 47 (2020) 4–60, <https://doi.org/10.1111/jcpe.13290>.
- [43] A.K.Y. Chan, Y.C. Tsang, S. Chu, C.H. Chu, Comprehensive strategies for preventive periodontal care in older adults, *Geriatrics (Basel)* 10 (2025) 72, <https://doi.org/10.3390/geriatrics10030072>.
- [44] A.K.Y. Chan, M. Tamrakar, K.C.M. Leung, C.M. Jiang, E.C.M. Lo, C.H. Chu, Oral health care of older adults in Hong Kong, *Geriatrics (Basel)* 6 (2021) 97, <https://doi.org/10.3390/geriatrics6040097>.
- [45] A.K.Y. Chan, Y.C. Tsang, O.Y. Yu, E.C.M. Lo, K.C.M. Leung, C.H. Chu, Clinical evidence for silver diamine fluoride to reduce dentine hypersensitivity: a systematic review, *J. Dent.* 142 (2024) 104868, <https://doi.org/10.1016/j.jdent.2024.104868>.
- [46] I. Willershausen, D. Schulte, A. Azaripour, V. Weyer, B. Briseño, B. Willershausen, Penetration potential of a silver diamine fluoride solution on Dentin surfaces. An ex vivo study, *Clin. Lab.* 61 (2015) 1695–1701, <https://doi.org/10.7754/clin.lab.2015.150401>.
- [47] L. Han, T. Okiji, Dentin tubule occluding ability of dentin desensitizers, *Am. J. Dent.* 28 (2015) 90–94.
- [48] L.I. Grossman, A systematic method for the treatment of hypersensitive dentin, *J. Am. Dental Associat.* 22 (1935) (1922) 592–602.
- [49] A.K.Y. Chan, M. Tamrakar, C.M. Jiang, Y.C. Tsang, K.C.M. Leung, C.H. Chu, Effectiveness of 38% silver diamine fluoride in reducing dentine hypersensitivity on exposed root surface in older Chinese adults: study protocol for a randomised double-blind study, *Dent. J. (Basel)* 10 (2022) 194, <https://doi.org/10.3390/dj10100194>.
- [50] C.H. Splieth, A. Tachou, Epidemiology of dentin hypersensitivity, *Clin. Oral Investig.* 17 (2013) S3–S8, <https://doi.org/10.1007/s00784-012-0889-8>.
- [51] X.X. Liu, H.C. Tenenbaum, R.S. Wilder, R. Quock, E.R. Hewlett, Y.F. Ren, Pathogenesis, diagnosis and management of dentin hypersensitivity: an evidence-based overview for dental practitioners, *BMC Oral Health N Hav* 20 (2020) 220, <https://doi.org/10.1186/s12903-020-01199-z>.
- [52] N.X. West, J. Seong, M. Davies, Management of dentine hypersensitivity: efficacy of professionally and self-administered agents, *J. Clin. Periodontol.* 42 (2015) S256–S302, <https://doi.org/10.1111/jcpe.12336>.
- [53] K. Bekes, C. Hirsch, What is known about the influence of dentine hypersensitivity on oral health-related quality of life? *Clin. Oral Investig.* 17 (2013) S45–S51, <https://doi.org/10.1007/s00784-012-0888-9>.
- [54] F. Graziani, M. Tinto, C. Orsolini, R. Izzetti, C. Tomasi, Complications and treatment errors in nonsurgical periodontal therapy, *Periodontol.* 2000 92 (2023) 21–61, <https://doi.org/10.1111/prd.12478>.
- [55] A. Kiesow, M. Menzel, F. Lippert, J.M. Tanzer, P. Milgrom, Dentin tubule occlusion by a 38% silver diamine fluoride gel: an in vitro investigation, *BDJ. Open.* 8 (2022) 1, <https://doi.org/10.1038/s41405-022-00095-8>.