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Magic potion for painless dentistry in children- silver diamine fluoride

[1]Dr. Sana Farooq, MDS, Tutor, Department of Pedodontics and Preventive Dentistry, Government Dental College and Hospital, Srinagar.

[2]Dr. Nazia Lone, MDS, Professor and HOD, Department of Pedodontics and Preventive Dentistry Government Dental College and Hospital, Srinagar.

[3]Dr Mohsin Sidiq, MDS, Lecturer, Department of Pedodontics and Preventive Dentistry, Government Dental College and Hospital, Srinagar.

[4]Dr. Hafsa Shah, Intern**,** Government Dental College and Hospital, Srinagar.

Corresponding Author: Dr. Sana Farooq, MDS, Tutor, Department of Pedodontics and Preventive Dentistry, Government Dental College and Hospital, Srinagar.

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Abstract

Background: This study aims to evaluate the education, knowledge and attitude among dentists towards Silver Diamine Fluoride (SDF).

Materials & Methods: A cross-sectional study was carried out on the sample size of 60 dental students who participated in the study after written informed consent was obtained from the participants after explaining to them the purpose of the study and ethical clearance was taken. A self-administered structured questionnaire was developed and send to the participants by the principal investigator, and the data was collected.

Results: Most participants (70%) said that they had heard about SDF application in dentistry. 59% didn't agree that they attended lectures/discussions about SDF. The most common source of knowledge about SDF was online internet (45%), followed by academic teaching (38%). However, 37% of participants agreed to the point that SDF is applied mainly to primary dentition, followed by permanent dentition (13%) whereas 50% were aware that it can be applied in both dentition.

Conclusions: Education and understanding of dental graduates about SDF might bring about greater usage of this innovative method of managing cavitated caries lesions, especially in children and thus making the whole experience of arresting caries pain free in pre-schoolers and children with special health care needs.

Keywords: Silver diamine fluoride, Cariostatic agents, Surveys.

Introduction

Silver Diamine Fluoride is a recently introduced non-invasive technique that has helped to reduce burden of

dental caries across the globe and it's an efficient, affordable, equitable and effective cariostatic agent having a noninvasive approach.[1,2] On August 2014 U.S. Food and Drug Administration (FDA) gave clearance for the first time for application of SDF preparation for dental use in the United States and its became available globally since April 2015. Horst et al. recommended use of SDF once or twice a year as a preventive agent in community dental health programs due to its low cost.[3]

According to Crystal and Niederman the effective use of SDF for arrest of caries and prevention in primary dentition was validated as it meet six quality aims of the US Institute of Medicine.[4] Literature has reported Silver diamine fluoride to be safe with no serious adverse events effective in arresting nearly 80% of the treated lesions and has added advantage of being applied with minimum training in less than 1 minute by health professionals in various health and community settings. The decayed teeth in preschool children remain mostly unrestored due to fear of pain associated with conventional restoration techniques in children and due to lack of income in under privileged communities, low schooling levels thus silver diamine fluoride as a dental hygiene service helps in minimising the gap between The data was collected and subjected to statistical analysis.

care and needs.[5] The present survey was done to evaluate dental students' knowledge, attitude and practice related to the application of SDF in Kashmir.

Materials and methods

A correctional survey was done on 60 dental graduates of Kashmir and the questionnaire was formulated using multiple-choice question and piloting was done to obtain information about knowledge and attitude among dentists towards Silver Diamine Fluoride. A self-administered structured questionnaire was developed and tested among a convenience sample of 10 patients, who were interviewed to gain feedback on the overall acceptability of the questionnaire in terms of length and language clarity; according to their feedback, the questions were corrected. The questionnaire was distributed using WhatsApp to the dental students of the college . Ethical approval for performing the survey was obtained from the Institutional review board under order number GDC/Pedo /2088 of Government Dental College and Hospital, Srinagar. Data was collected through an online survey form to avoid direct interaction with the participants and to prevent cross-contamination in this COVID pandemic situation in the month of March 2022.

Table 1: Questionnaire

1. Are you aware about SDF application in Pediatric Dentistry?	A Yes	B No				
2. Has silver diamine fluoride being included in your didactic classes?	A. Never	B Yes, with few patients	C yes with multiple :2 or more			
3. Do you have clinical experience of using SDF in pediatric or adult patients?	A. None	B Yes, with a few patients	C Yes, with multiple patients			
4. Does SDF have antimicrobial properties and promote fluorapatite formation?	A. Yes	B. No	C. Don't know			

5. From financial perspective SDF is a good option for preventing caries for older adults and pediatric patients?	A Strongly Disagreed	B Disagree	C Neutral	D Agree	E Strongly agree	
6. What percentage of SDF is used in Pediatric dentistry?	A.38% SDF in primary teeth to arrest cavitated lesions	B.3.8% SDF in primary teeth to arrest cavitated lesions	C Both a and b			
7. What is the source of knowledge amount silver diamine fluoride?	A. Online interest	B Academic teachings	C seminars	D family and friends	Others please specify	
8. Which dentition do you think SDF is used for ?	A. Only primary dentition	B. Only permanent dentition	C Both the dentition			
9. The type of lesion SDF is used for?	A Enamel lesions	B Dentin lesions	C Both enamel and dentin lesions	D With or without lesion		
10. The possible barriers to the use of SDF are?	A Scientific lesion B Inadequate training	C Cost D Tooth staining	E Patient acceptance F Doesn't restore shape and function	G Doesn't arrest caries	H. All of the above	I. Others please specify

Result

A total of 60 dental students of final year, interns undergoing rotational internship and junior residents responded to the questionnaire that was what sapped to them during pandemic in March 2022. Most participants, said that they were aware about SDF application in dentistry and 70% of the respondents knew about it (Figure 1).

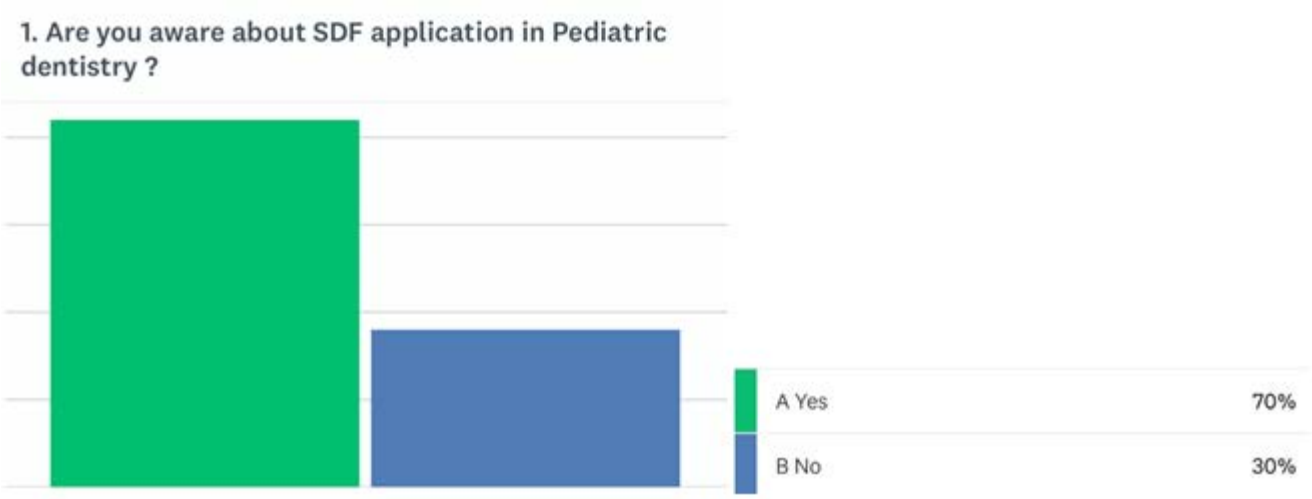


Figure 1

59% didn't agree on attending lectures/ discussions about SDF and when enquired about the participant's source of knowledge about SDF (Figure 2) (Table 1) and 79% of respondents have never used SDF in pediatric dentistry (Figure 3).

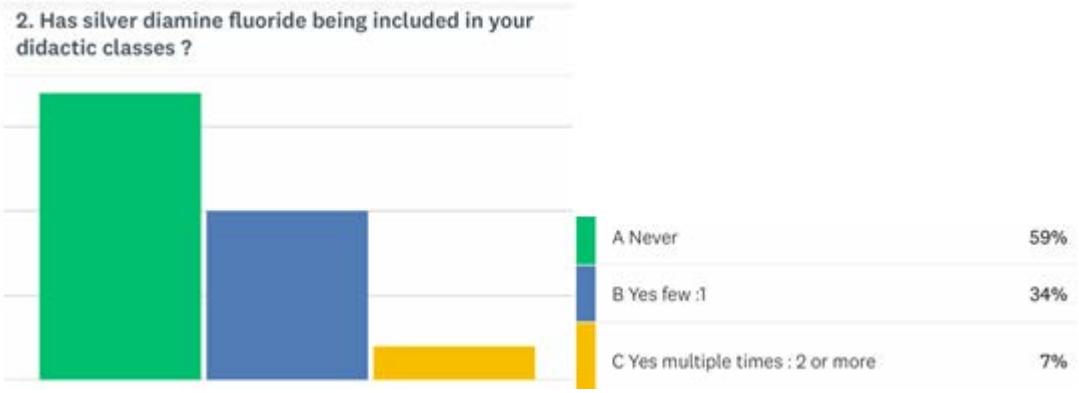


Figure 2:

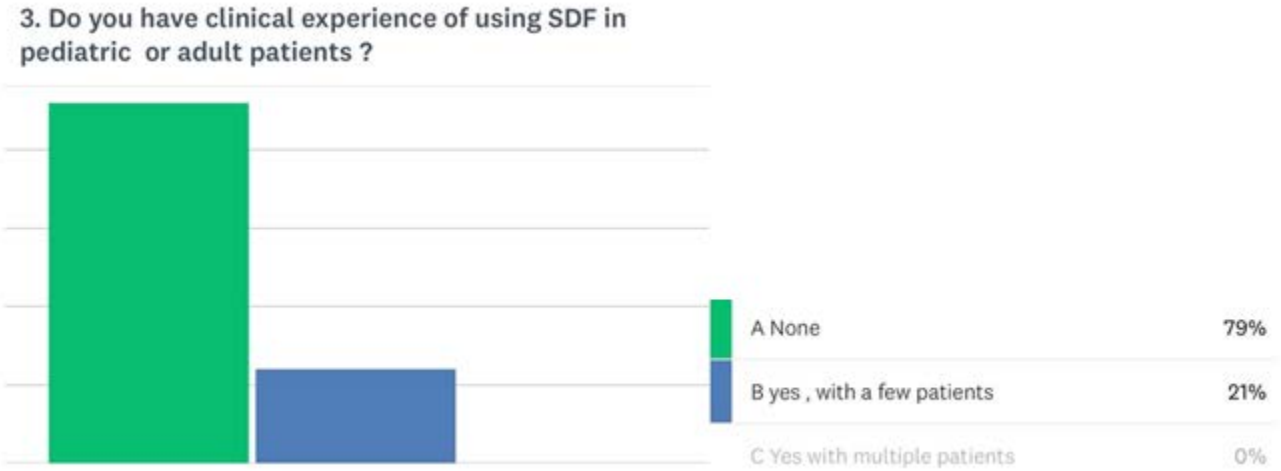


Figure 3

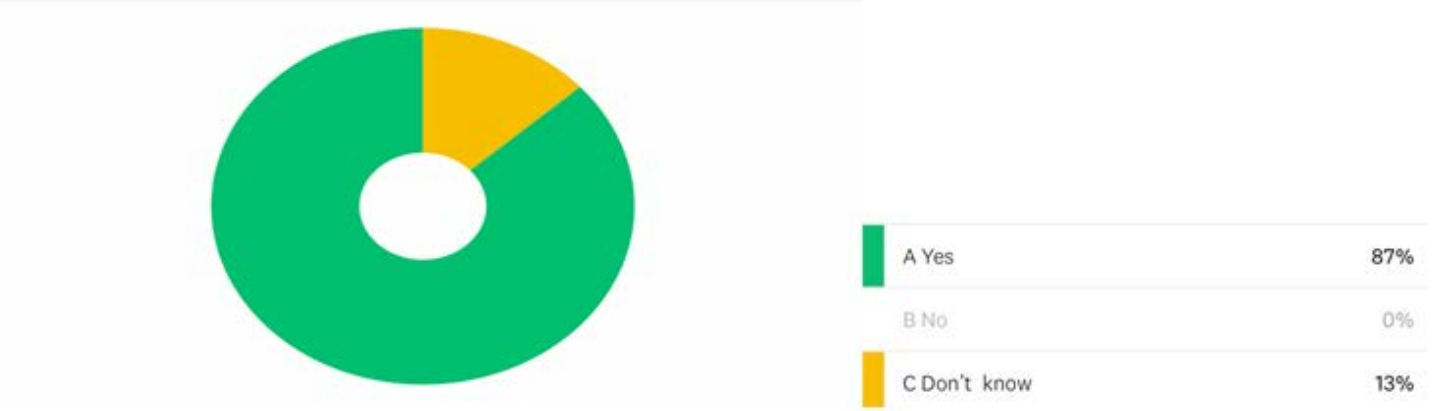


Figure 4

87% of the respondents knew the mechanism of action of SDF by having anti-microbial properties and promoting fluorapatite formation (Figure 4).

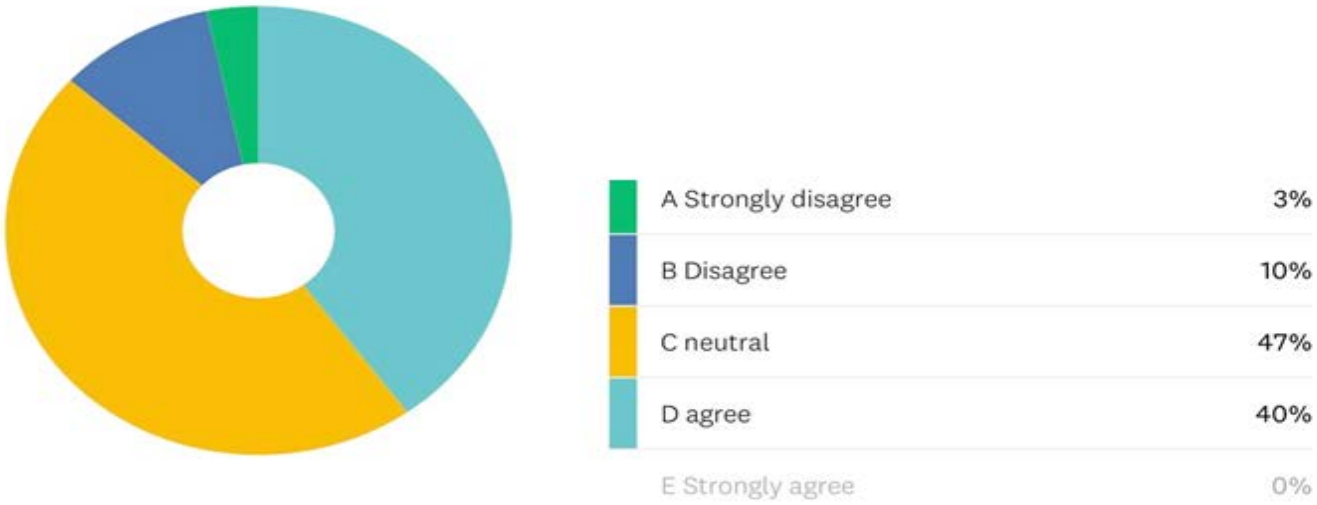


Figure 5

When enquired from financial perspective about SDF being a good option for preventing caries for older adults and pediatric patients 40% agreed and 47% were neutral regarding it (Figure 5).

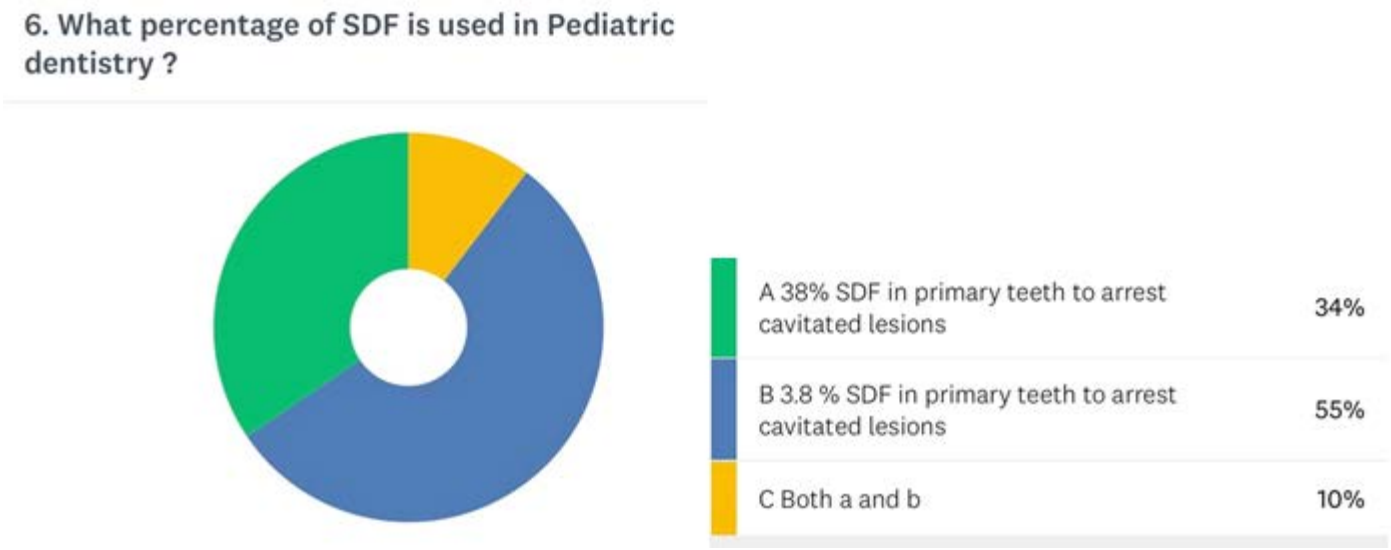
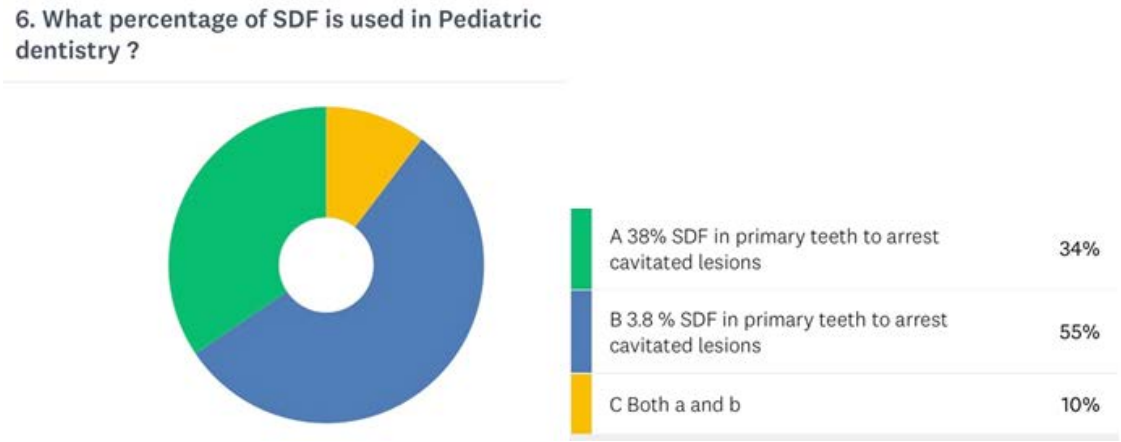


Figure 6



55% of the respondents didn't know exact percentage of SDF used for arresting cavitated lesions (Figure 6).

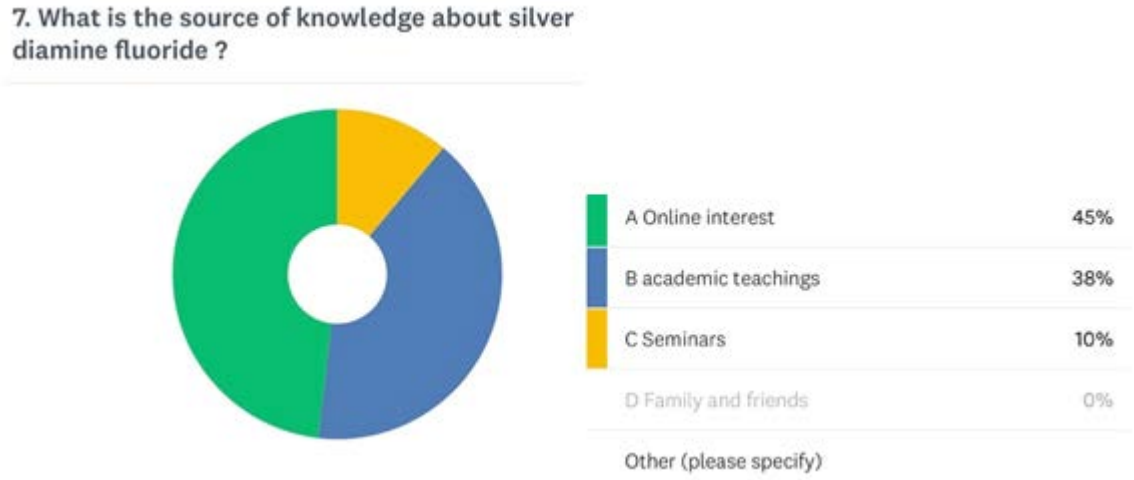


Figure 7

45% stated the primary source of information is from the online internet, followed by academic teaching by 38% of the respondents (Figure 7).

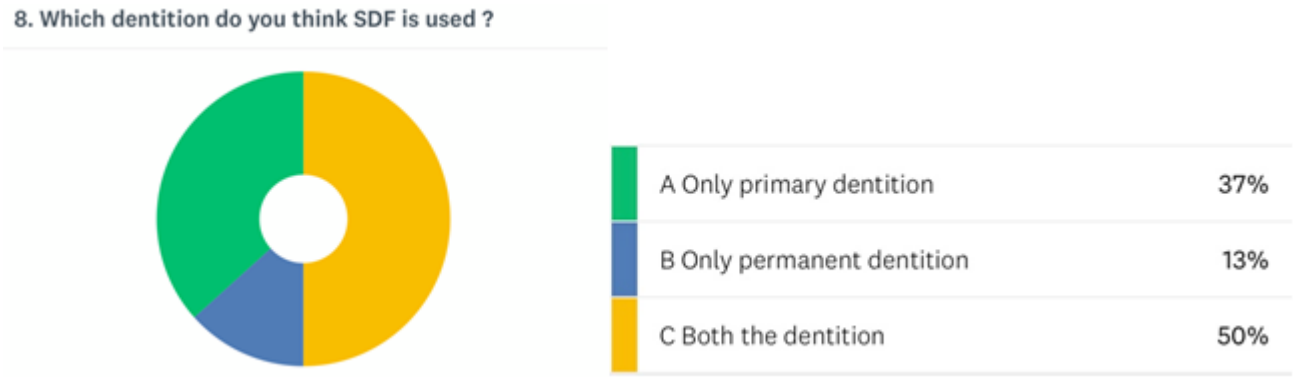


Figure 8

37% applied SDF mainly to primary dentition, followed by 13% to permanent dentition whereas 50% applied to both primary dentition and permanent dentition (Figure 8).

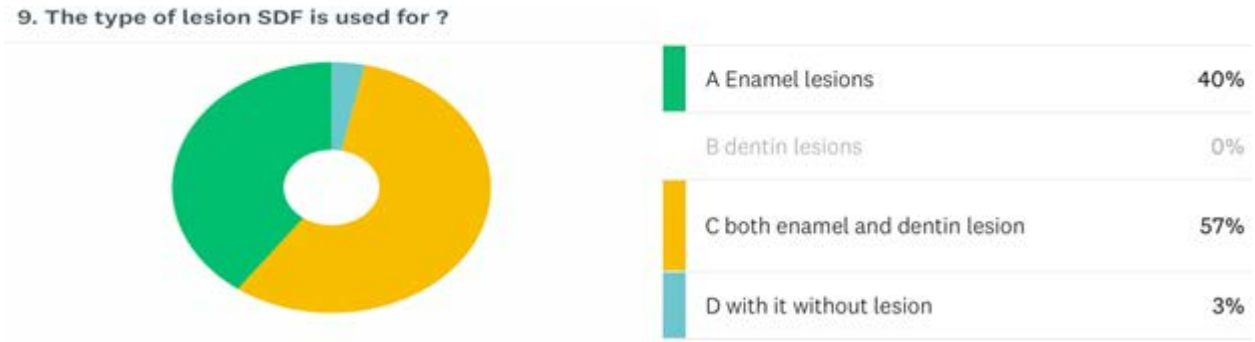


Figure 9

The main barriers reported to the use of SDF among those that did not use it was a tooth staining (27%) followed by inadequate training in 23% and scientific knowledge (13%) (**Figure 10)**

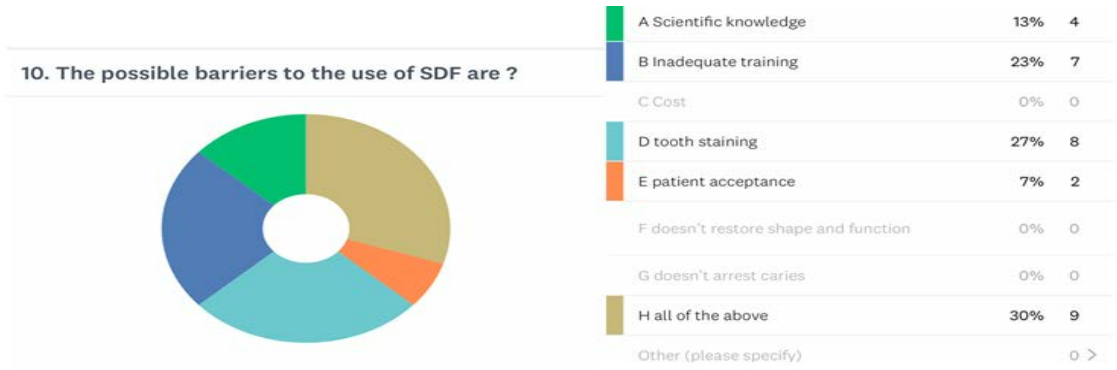


Figure 10

Discussion

The most commonly used concentration of silver diamine fluoride is 38% where 44,800 ppm of fluoride and 255, 000 ppm of silver other than 10,12 and 30 % of SDF concentration used. It has two elements having synergistic activity with bactericidal action on cariogenic microorganisms by promoting mineralization, inhibition of demineralization of tooth tissues and decreases

destruction of organic portion of dentin and silver ions become antimicrobial and bactericidal brokers within lesions by destroying bacterial membranes, denaturing proteins, and inhibiting DNA replication. Calcium fluoride and fluor hydroxyapatite are two compounds formed after SDF application where Calcium fluoride forms a reservoir of fluoride that will be released if a pH drop occurs and fluor hydroxyapatite is formed when fluoride is incorporated into the hydroxyapatite crystals thus helping in remineralization and makes the tooth more resistant to further demineralization.[2]

Nelson T, Scott JM, Crystal YO, Berg JH, Milgrom P. in 2016 stated 89.2% of dentists felt silver diamine fluoride should be used only with high-risk patients and the majority agreed of its use in primary and permanent teeth. 91.8% reported parental acceptance to be a barrier to use of silver diamine fluoride [6]

Kumar, A., Cernigliaro, D., Northridge, M.E. *et al.* in 2019 conducted a survey of caregiver acceptance of silver diamine fluoride treatment for childhood caries and the study concluded caregiver acceptance of SDF treatment is high; child's age and caregiver comfort are associated with acceptance. Thus providers need to communicate the risks and benefits of evidence-based dental treatments to increasingly diverse caregiver and patient populations.[7]

M Zakirulla et al.in 2021stated 59 (58%) said that they did not hear about SDF application in dentistry which is contrary to our study where 70% respondents knew about SDF. The primary source of information about SDF application was from the online internet (32%), followed by academic teaching (25%) which was similar to our study where 45% stated the primary source of information is from the online internet, followed by academic teaching by 38% of the respondents. 31% agreed to the point that SDF is applied mainly to primary dentition whereas 21% said its application is only done to carious lesions of permanent dentition .[8]

The SDF panel of the American Academy of Pediatric Dentistry (AAPD) backs using 38% SDF in arresting the cavitated caries lesions of primary teeth for the extensive caries management program and after every application of 38% SDF solution only 0.2 mg fluoride is released which is far under the probably toxic dosage of 5 mg/kg and in our study 55% of respondents were unaware of exact percentage.[9]

Ezzeldin T, Al-Awasi KA, Bader RM, et al. in 2021 stated awareness of SDF was found to be 73.6% among specialists, 54.9% among graduates and 29.6% among students which was similar to our study whereas awareness of HALL technique for stainless steel crown in pediatric dentistry was found statistically similar in all participants groups i.e. 42.7% in students, 55.5% in graduates and 54.9% in specialist group ($p = 0.125$). The study concluded that non- invasive techniques are very useful tools in general but specifically during Covid-19 pandemic where they can play a major role in preventing the spread of infection, arresting decay, alleviating pain and anxiety without resorting to aggressive treatment like pulp treatment/extraction. [10]

Dang C et al in 2020 concluded graduating students appear inclined to utilize SDF upon entering private practice.[11]

Knight et al stated tooth discoloration can be reduced by adding potassium iodide (KI) before application to the SDF.[12] Whereas Sayed et al. reported that glutathione biomolecule reduces tooth discoloration after SDF application especially on enamel and KI is contraindicated in expectant women and during the first 6 months for lactating women as it can cause thyroid of child related to iodide overdose.[13]

SDF is an integral tool for providing minimally invasive paediatric dentistry (MIPD) coupled with aerosol free dentistry (AFD) and is beneficial for special care dentistry. [14] It's an alternative choice for the managing dental caries especially if dental caries is at its early stages, without pulpal signs and symptoms.[15]

Conclusion

Silver diamine fluoride is an effective, inexpensive, and sustainable option for high-risk children and adolescents and children with special health care needs in arresting dentin caries and thus preventing its progression to pulp diseases. It plays an excellent role as an antimicrobial agent by preventing formation of biofilm and dental caries progression.

Literature has stated twice application of SDF annually helps in preventing dental caries by 84.8% compared to single application. Education, understanding of SDF and its significant usage in managing cavitated caries lesions, especially in children is required with the only most-cited barrier being tooth staining connected with caries arrest and awareness related to the percentage of SDF used for arresting caries was less in our study.

In future more research needs to be done to determine the status of the tooth with arrested lesions if SDF treatment is withdrawn after 2–3 years along with the long-term safety of applying SDF repeatedly.

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