

## Assessment Of Dentist's Knowledge, Attitudes, And Professional Behavior Regarding Silver Diamine Fluoride: A Questionnaire Study

Dr. Saurabh Agarwal<sup>1</sup>, Dr. Navpreet Kaur<sup>2</sup>, Dr. Himanshu Gupta<sup>3</sup>, Dr. Sourabh Malik<sup>4</sup>, Dr. Sachin Sharma<sup>5</sup>, Dr. Radhika Jeloka<sup>6</sup>

<sup>1,4,5,6</sup>Post Graduate student, Department of Public Health Dentistry, K. D. Dental College and Hospital, Mathura, U.P.

<sup>2</sup>Professor & Head, Department of Public Health Dentistry, K. D. Dental College and Hospital, Mathura, U.P.

<sup>3</sup>Reader, Department of Public Health Dentistry, K. D. Dental College and Hospital, Mathura, U.P.

Corresponding authors email : Dr. Navpreet Kaur (drnavpreetmds@gmail.com)

**Abstract: Background:** Dental caries is a major public health problem and is handled through either treatment or prevention. Unlike other fluoride based caries preventive agents, Silver Diamine Fluoride (SDF) can simultaneously prevent and arrest coronal and root dentine caries. **Aim and Objectives:** To assess dentist's Knowledge, Attitudes, and Professional Behavior regarding SDF. **Methods:** A cross-sectional, online based survey was conducted on voluntary dental professionals. Distribution of self-structured questionnaire was done through convenience sampling technique. Chi square test was used to analyze the data. **Results:** A total of 290 dentists completed the survey. About 15.9 % participants had Knowledge regarding SDF in dentistry. The majority of respondents showed a positive Attitude toward SDF by accepting it as a good alternative treatment for children with behavioral problems or medical issues (46.2%). However, 41% expect that use of SDF increase in the future. **Conclusion:** Results suggested that the majority of respondents were lacking in Knowledge regarding usage of SDF in dentistry.

**Keywords:** Caries prevention, dental caries, remineralisation, silver diamine fluoride.

### INTRODUCTION

Dental caries is one of the most common conditions which have an enormous public health impact on the overall health, social wellness, income of individuals, and healthcare systems.<sup>1</sup> Dental caries is one of the most prevalent preventable diseases worldwide, with a prevalence rate of 69%-79%. Children in preschool encounter interrupted sleep, increased absence from school and reduced ability to learn which affects children's general health and growth. Preventive measures include nutritional counseling, use of fluoride, antimicrobial agents, and oral hygiene instructions.<sup>2</sup> The use of preventive fluoride reagents such as Sodium Fluoride (NaF) due to remineralization and antimicrobial properties for the prevention of dental caries has been recognized long back, and amongst these agents Silver Diamine Fluoride (SDF) has acquired substantial attention recently as a caries preventive agent of choice.<sup>3</sup> Silver Diamine Fluoride (SDF) is a non-invasive, low-cost, antimicrobial solution and has remineralization potential used to arrest caries in ambulatory attendance of very young children, patients with special needs, or medically compromised individuals.<sup>4</sup> The use of Silver Diamine Fluoride (SDF), also known as Silver Diamine Fluoride, which is used to arrest dental caries in a non-invasive way and has recently grown in popularity. SDF's mode of action is two-sided: the silver-ions are anti-bacterial and inhibit dentine collagen degradation, and the fluoride-ions (48800ppm) enhance remineralisation.<sup>5</sup> Main advantages of SDF are affordability and ease of application. SDF is a non-invasive alternative treatment to conventional methods (drill and fill) in dental caries management. Its major drawback is the esthetic outcome that manifests as a black stain on arrested carious teeth.<sup>3</sup> Application of 38% SDF solution twice a year had a success rate of 84.8% in impeding caries.<sup>4</sup> There is not much research carried out in past regarding the knowledge, attitude and professional behaviour of dentists toward SDF.

### MATERIALS AND METHOD

Present study was a cross-sectional, observational, web based survey conducted on Knowledge, Attitude and Professional Behavior of Dentist's regarding Silver Diamine Fluoride.

### Methodology

- Present study was a cross-sectional, observational, web based survey conducted in August 2023 to September 2023. The Institutional Ethical Committee approval was obtained for the survey. Sample size of 290 was chosen. The convenience sampling technique was used to send the survey to dental professionals and who could potentially recruit more dentists from their acquaintances. By using Google forms, an online structured questionnaire with annexed informed consent form was developed. The survey link was generated and was sent through online platforms like WhatsApp, e-mails to the contacts of the investigators. The dental professionals were motivated to refer links to their contacts for participation. The participants were auto-directed to the survey on clicking the link.

### Data analysis

- Data was recorded, tabulated, and statistically analyzed using SPSS version. Descriptive statistics such as frequency distributions and percentages were computed to provide an overview of the responses.

**RESULTS** Majority i.e. 128(44.1%) were from 31-40 years of age and 197(67.9%) were females. (Table 1)

**TABLE 1- DISTRIBUTION OF DEMOGRAPHIC DETAILS**

| S.NO | CHARACTERISTIC    | CLASSIFICATION    | N (%)<br>(N=290) |
|------|-------------------|-------------------|------------------|
| 1.   | Age               | 21-30 Years       | 114 (39.3%)      |
|      |                   | 31-40 Years       | 128 (44.1%)      |
|      |                   | 41-50 Years       | 48(16.6%)        |
| 2.   | Gender            | Male              | 93(32.1%)        |
|      |                   | Female            | 197(67.9%)       |
| 3.   | Years of practice | 5 Years           | 114(39.3%)       |
|      |                   | >5 and <10 Years  | 104(35.9%)       |
|      |                   | >10 and <20 Years | 72(24.8%)        |
|      |                   | >20 Years         | 0(0%)            |

Approximately, 23.4% had well knowledge about advantages of SDF in dentistry. 22(7.6%) knew how SDF is used to treat tooth hypersensitivity. 23.4% and 15.2% knew how SDF is used to treat dental caries among pediatric and adult patients. 8.3% and 3.8% strongly agreed that SDF was used to arrest non cavitated and cavitated lesions. (Table 2)

**TABLE 2- DISTRIBUTION OF KNOWLEDGE OF DENTISTS REGARDING SILVER DIAMINE FLUORIDE**

| Question                                                            | Not at all | A little  | Somewhat   | Well      | Very well | Total     |
|---------------------------------------------------------------------|------------|-----------|------------|-----------|-----------|-----------|
| Do you have knowledge about the SDF in dentistry?                   | 11(3.8%)   | 50(17.2%) | 115(39.7%) | 68(23.4%) | 46(15.9%) | 290(100%) |
| Do you have knowledge about the advantages of SDF in dentistry?     | 11(3.8%)   | 63(21.7%) | 102(35.2%) | 68(23.4%) | 46(15.9%) | 290(100%) |
| Do you have knowledge regarding SDF uses in tooth hypersensitivity? | 24(8.3%)   | 87(30%)   | 100(34.5%) | 57(19.7%) | 22(7.6%)  | 290(100%) |

|                                                                           |                   |           |            |            |                |           |
|---------------------------------------------------------------------------|-------------------|-----------|------------|------------|----------------|-----------|
| Do you have knowledge regarding SDF uses in pediatric patient?            | 11(3.8%)          | 53(18.3%) | 81(27.9%)  | 77(26.6%)  | 68(23.4%)      | 290(100%) |
| Do you have knowledge regarding SDF uses in adult patient?                | 77(26.6%)         | 61(21%)   | 86(29.7%)  | 22(7.6%)   | 44(15.2%)      | 290(100%) |
| Question                                                                  | Strongly disagree | Disagree  | Neutral    | Agree      | Strongly agree | Total     |
| Can SDF be used to arrest non cavitated lesions?                          | 22(7.6%)          | 0(0%)     | 11(3.8%)   | 233(80.3%) | 24(8.3%)       | 290(100%) |
| Can SDF be used to arrest cavitated lesions?                              | 11(3.8%)          | 40(13.8%) | 35(12.1%)  | 193(66.6%) | 11(3.8%)       | 290(100%) |
| Should SDF be used prior to all restorations in patients?                 | 22(7.6%)          | 59(20.3%) | 141(48.6%) | 33(11.4%)  | 35(12.1%)      | 290(100%) |
| Should SDF be used prior to placing all restorations in at risk patients? | 11(3.8%)          | 35(12.1%) | 110(37.9%) | 101(34.8%) | 33(11.4%)      | 290(100%) |

Among total, 76.6% agreed that infected soft dentin must be removed before applying SDF.42.4% agreed that SDF treatment is good for arresting caries, 46.2% agreed that SDF is a good treatment alternative among the children with behavioral issues, 50.7% agreed that SDF is good, when patients are medically fragile, 61.4% agreed that SDF could be used when patients have severe dental anxiety,50% agreed that SDF is good treatment option for primary teeth and 50% agreed that SDF is good treatment option for permanent teeth when the lesion is not in the esthetic zone. (Table 3)

**TABLE 3- DISTRIBUTION OF ATTITUDE OF DENTISTS REGARDING SILVER DIAMINE FLUORIDE**

|                                                                                                                                        |                   |          |           |            |                |           |
|----------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|-----------|------------|----------------|-----------|
| Question                                                                                                                               | Strongly disagree | Disagree | Neutral   | Agree      | Strongly agree | Total     |
| Do you agree that infected soft dentin must be removed before applying SDF?                                                            | 11(3.8%)          | 0(0%)    | 35(12.1%) | 222(76.6%) | 22(7.6%)       | 290(100%) |
| Do you agree that SDF treatment is good for arresting caries, specially when is not possible to restore all lesion in one appointment? | 11(3.8%)          | 22(7.6%) | 88(30.3%) | 123(42.4%) | 46(15.9%)      | 290(100%) |
| Do you agree that SDF is a good treatment alternative among the children with behavioral issues?                                       | 11(3.8%)          | 0(0%)    | 73(25.2%) | 134(46.2%) | 72(24.8%)      | 290(100%) |

|                                                                                               |               |           |            |            |           |           |
|-----------------------------------------------------------------------------------------------|---------------|-----------|------------|------------|-----------|-----------|
| Is SDF good, when patients are medically fragile?                                             | 11(3.8%)      | 35(12.1%) | 64(22.1%)  | 147(50.7%) | 33(11.4%) | 290(100%) |
| Can SDF be used when patients have severe dental anxiety?                                     | 11(3.8%)      | 24(8.3%)  | 33(11.4%)  | 178(61.4%) | 44(15.2%) | 290(100%) |
| Is SDF good treatment option for primary teeth when the lesion is not in the esthetic zone?   | 22(7.6%)      | 11(3.8%)  | 77(26.6%)  | 145(50%)   | 35(12.1%) | 290(100%) |
| Is SDF good treatment option for primary teeth when the lesion is in the esthetic zone?       | 22(7.6%)      | 46(15.9%) | 101(34.8%) | 99(34.1%)  | 22(7.6%)  | 290(100%) |
| Is SDF good treatment option for permanent teeth when the lesion is not in the esthetic zone? | 22(7.6%)      | 13(4.5%)  | 99(34.1%)  | 145(50%)   | 11(3.8%)  | 290(100%) |
| Is SDF good treatment option for permanent teeth when the lesion is in the esthetic zone?     | 35<br>(12.1%) | 70(24.1%) | 86(29.7%)  | 77(26.6%)  | 22(7.6%)  | 290(100%) |
| Can SDF used in patients with microstomia and difficult access for dental treatment?          | 11(3.8%)      | 22(7.6%)  | 64(22.1%)  | 182(62.8%) | 11(3.8%)  | 290(100%) |

Among the subjects, 25.2% use SDF in clinical practices. 23.4% often used SDF in dental caries of primary teeth. 7.6% often used SDF in dental caries of permanent teeth. (Table 4)

**TABLE 4- DISTRIBUTION OF PROFESSIONAL BEHAVIOURS OF DENTISTS REGARDING SILVER DIAMINE FLUORIDE**

| Question                                                  | Never      | Rarely     | Sometimes | Often     | Very often | Total     |
|-----------------------------------------------------------|------------|------------|-----------|-----------|------------|-----------|
| How often do you use SDF in clinical practices?           | 217(74.8%) | 21(7.2%)   | 17(5.8%)  | 20(6.8%)  | 15(5.2%)   | 290(100%) |
| Do you use SDF in dental caries of primary teeth?         | 86(29.7%)  | 74(25.5%)  | 40(13.8%) | 68(23.4%) | 22(7.6%)   | 290(100%) |
| Do you use SDF in dental caries of permanent teeth?       | 136(46.9%) | 72(24.8%)  | 49(16.9%) | 22(7.6%)  | 11(3.8%)   | 290(100%) |
| Do you use SDF in your office to treat tooth sensitivity? | 112(38.6%) | 101(34.8%) | 33(11.4%) | 33(11.4%) | 11(3.8%)   | 290(100%) |
| Do you use SDF in your office to prevent dental caries?   | 49(16.9%)  | 100(34.5%) | 62(21.4%) | 68(23.4%) | 11(3.8%)   | 290(100%) |

|                                                       |          |           |         |          |          |           |
|-------------------------------------------------------|----------|-----------|---------|----------|----------|-----------|
| Would you like to use SDF in your practice in future? | 22(7.6%) | 37(12.8%) | 90(31%) | 119(41%) | 22(7.6%) | 290(100%) |
|-------------------------------------------------------|----------|-----------|---------|----------|----------|-----------|

## DISCUSSION

Dental caries is one of the widespread diseases of stomatognathic system and its prevalence ranges from 49% to 83% across different countries.<sup>6</sup> Silver Diamine Fluoride (SDF) was developed in Japan in the 1960s. It is a clear solution containing silver and fluoride ions. Because of its anti-bacterial and remineralizing effect, Silver Diamine Fluoride has been used in managing dental caries for decades worldwide.<sup>8</sup>

Silver Diamine Fluoride (SDF) stands out in this new approach due to its acclaimed ability to halt the progression of existing carious lesions and prevent the emergence of new ones.<sup>9</sup> Its application's simplicity and non-invasive nature, along with affordability make SDF an attractive choice, especially in community health initiatives and for individuals with limited access to comprehensive dental care.<sup>10</sup> On the contrary, SDF has its own disadvantages. One of these is staining. It stains the enamel and dentin with a dark stain, which might cause some esthetic concerns. The availability and recommendation of SDF by dental professionals can further impact its use. Additionally, clinician's attitudes and communication skills are critical in addressing parents' concerns and promoting acceptance of this treatment option.<sup>12</sup>

In the present study, the majority of participants 44.1% were aged between 31-40 years, which contrasts with the findings of Beenish Abbas et al<sup>5</sup>, where the majority 63.1% fell within the 20-30 age range. Regarding gender, 67.9% of participants were female, similar to the study conducted by Jiska Mehlawat et al<sup>1</sup>, where 75.2% were females. In terms of clinical experience, 39.3% had been practicing for five years, aligning with Sofie C.H. Schroe et al<sup>4</sup> study, in which 34% had a similar duration of practice. In total, 23.4% of participants reported having good knowledge, which is consistent with Jiska Mehlawat et al<sup>1</sup> study, where 24.4% exhibited good knowledge. Furthermore, 19.7% of participants had a well-rounded understanding of SDF's use in treating tooth hypersensitivity. This contrasts with the 9.6% reported in Mehlawat et al<sup>1</sup> study. Notably, 23.4% of participants showed very good knowledge about SDF's application in pediatric dentistry, while 15.2% demonstrated strong understanding regarding its use in adult patients. These findings are in line with Mehlawat et al<sup>1</sup> study, where 24.8% and 12%, respectively, showed comparable knowledge.

In terms of SDF's clinical applications, 80.3% of participants agreed that SDF could arrest non-cavitated lesions, and 66.6% believed it could arrest cavitated lesions. These results differ from those of Ghadah Alajlan et al<sup>3</sup>, in which only 40.7% and 33.8% agreed on these uses, respectively. Furthermore, 76.6% of participants in the present study concurred that infected soft dentin should be removed before applying SDF in contrast with Mehlawat et al<sup>1</sup> study. On the subject of SDF's effectiveness in arresting caries, 42.2% of participants found SDF treatment beneficial. These findings are similar to those of Mehlawat et al.<sup>1</sup>, where 38.4% held a similar view. Additionally, 3.8% strongly disagreed that SDF was a suitable treatment for children with behavioral issues, mirroring Alajlan et al.<sup>3</sup> study, in which 5.4% disagreed.

Regarding special patient conditions, 11.4% of participants agreed that SDF was an effective treatment for medically fragile patients, while 15.2% believed it could be used for those with severe dental anxiety. These results align with Alajlan et al.<sup>3</sup> findings, where 15.2% and 18.3%, respectively, expressed similar opinions. Interestingly, 7.6% agreed that SDF was a viable treatment for primary teeth lesions outside the esthetic zone, which is consistent with Beenish Abbas et al<sup>5</sup> study, where 9.4% strongly agreed with this application. Further, 7.6% strongly disagreed that SDF was a suitable treatment for permanent teeth lesions outside the esthetic zone. This is in line with Ghadah Alajlan et al.<sup>3</sup>, where 4.7% held a similar view. In patients with microstomia or those requiring difficult access for dental treatment, 3.8% of participants in the current study strongly disagreed that SDF could be used effectively, which mirrors the 3% disagreement reported by Alajlan et al.<sup>3</sup>

In clinical practice, 25.2% of participants reported using SDF, which is somewhat consistent with the findings of Claudia Salerno et al.<sup>7</sup>, where 20.6% of respondents used SDF in their clinical practices. However, 29.7% of participants in the current study indicated that they had never used SDF for dental caries in primary teeth and 46.9% of participants had never used SDF for dental caries in permanent teeth. Limitations of study were small

sample size and participants recruited online which may not be representative of the entire population. So, further studies are recommended taking larger sample size including dentists from other sectors and different regions.

## CONCLUSION

SDF is the treatment modality with efficacy to arrest carious lesions. Yet, the Knowledge regarding advantages of SDF was less. In this present study only 23.4% subjects had well knowledge regarding advantages of SDF. Attitudes were overall positive, indicating their willingness to use SDF. In total 25.2% subjects were using SDF in clinical practice.

So, this survey has created awareness among the dentist regarding use of SDF. It is recommended that the need for development and availability of courses/training about SDF is must, so that the clinicians have a better knowledge regarding its use.

## REFERENCES

1. Jiksa Mehlaawat, Charu Mohan Marya , Ruchi Nagpal , Sakshi Kataria , Pratibha Taneja . Dentists' Knowledge, Attitudes, and Professional Behavior regarding Silver Diamine Fluoride: a cross-sectional questionnaire study. *J Indian Assoc Public Health Dent* 2022; 20:188-92.
2. Intan Elliayana Mohammed, Nursharhani Shariff, Muhammad Faiz Mohd Hanim, Mohd Yusmiadil Putera Mohd Yusof, Budi Aslinie Md Sabri, Nor Faedah Md Bohari and Annapurny Venkiteswaran. Knowledge, Attitudes and Professional Behavior of Silver Diamine Fluoride among dental personnels: a systematic review. *Children* 2022; 9 (1936); 1-23.
3. Ghadah Alajlan, Hessa Alshaikh, Lamar Alshamrani, Mehak Alneji. Knowledge on and Attitude toward Silver Diamine Fluoride among Saudi dental practitioners in Riyadh Public Hospitals. *Clinical, Cosmetic and Investigational Dentistry* 2020;12 399–407.
4. Sofie C.H. Schro, Clarissa C. Bonifacio, Josef J. Bruers, Nicola P. T. Innes and Daniela Hesse. General and paediatric dentists' Knowledge, Attitude and Practice regarding the use of Silver Diamine Fluoride for the management of dental caries: a national survey in the Netherlands. *BMC Oral Health* 2022; 22;458.
5. Beenish Abbas, Sidra Aamer, Fizza Sahar Anwar, Farah Farhan, Mehreen Wajahat, Zohaib Khurshid. Perception, Knowledge, and Professional Behavior of dentists about Silver Diamine Flouride. *European Journal of General Dentistry* 2022; 11(1); 32-37.
6. Claudia Salerno, Giulio Conti, Silvia Cirio, Cinzia Maspero, Andrea Senna, Guglielmo Campus and Maria Grazia Cagetti. Training received, Knowledge, and use of Silver Diamine Fluoride among Italian dentists: a nationwide survey. *BMC Oral Health* 2025; 25(106): 1-10.
7. T. N. Rajakumari, G. Thiruvankadam, D. Vinola, M. Kruthika. Silver Diamine Fluoride – a review. *Journal of Academy of Dental Education* 2020; 6(2): 5-10.
8. Sherry Shiqian Gao, Gwendolyn Amarquaye, Peter Arrow, Kalpana Bansal, Raman Bedi, Guglielmo Campus, Kitty Jieyi Chen, Ana Cláudia Rodrigues Chibinski, Tselmuun Chinzorig, Yasmi O. Crystal, Duangporn Duangthip1, Maria Laura Ferri, Morenike Oluwatoyin Folayan, Ariuntuul Garidkhuu, Hamdi H. Hamama, Varangkanar Jirarattanasopha, Arthur Kemoli, Soraya C. Leal, Pattarawadee Leelataweewud, Vijay Prakash Mathur, Tshepiso Mfolo, Yasuko Momoi, Noline Potgieter, Arzu Tezvergöl-Mutluay, Edward Chin Man Lo and Chun Hung Chu. Global Oral Health Policies and Guidelines: Using Silver Diamine Fluoride for caries control. *Frontiers in Oral Health* 2021; 2: 1-12.
9. Saeed S. Alqalaleef, Rabab A. Alnakhli, Yousef Ezzat, Hamad I. AlQadi, Abdulrahman D. Aljilani and Zuhair S. Natto. The role of Silver Diamine Fluoride as dental caries preventive and arresting agent: a systematic review and meta-analysis. *Frontiers in Oral Health* 2024; 5: 1-14.
10. Pooja R Shivasharan, Ashwin M Jawdekar, Neha N Pankey, Surej Unnikrishnan. Acceptance of parents to Silver Diamine Fluoride in pre-cooperative children: a cross-sectional study. *Journal of South Asian Association of Pediatric Dentistry* 2019; 2(2): 49-55.
11. Abdullah Faraj Alshammari, Rana Homoud Alenzi, Ashwaq Abdullah Alanezi, Abdulmjeed Sadoon Enizy, Ahmed Mohammed Aldakhil, Khlood Abdulkader Alkurdi. Knowledge and Attitude of dentists toward Silver Diamine Fluoride in Saudi Arabia. *International Journal of Clinical Pediatric Dentistry* 2021; 14(5):662–665.
12. Ammar Albujee, Hadi Ghasemi , Mahshid Namdari, Abbas Taher, Alya Almahafidha and Mohammad H. Khoshnevisan. Parental perception of the application of Silver Diamine Fluoride (SDF) for dental caries treatment among Iraqi school children: a cross-sectional study. *BDJ Open* 2025; 11(14): 1-6.