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SILVER DIAMINE FLUORIDE IN INDIAN DENTISTRY: EXPLORING AWARENESS, ACCEPTANCE, AND CLINICAL UTILIZATION AMONG PRACTICING DENTISTS

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ABSTRACT

An online survey was conducted among practicing dentists using an online questionnaire to assess the awareness, acceptance, and clinical usage of SDF. 500 dentists participated in the online survey. The data obtained were analysed statistically.

The survey maps awareness, acceptance, and clinical use of SDF among Indian dentists, showing limited clinical uptake despite favorable attitudes, with knowledge gaps as the principal barrier.

INTRODUCTION

The global burden of dental caries is a significant public health concern, affecting individuals of all age groups. It contributes to substantial treatment expenses and highlights inequalities in access to dental care services [1]. During recent years, the management of dental caries has shifted from predominantly invasive approaches to preventive strategies and minimally invasive techniques. This transition is largely driven by the increasing emphasis on preserving tooth structure and minimizing patient discomfort [2]. One preventive approach that has gained considerable attention among researchers and clinicians is silver diamine fluoride (SDF). The adoption of preventive strategies, such as SDF therapy, plays a crucial role in enhancing patient outcomes, reducing treatment expenses, and promoting overall oral

health. SDF was developed in Japan in the 1960s by Professor Yamaga and Professor Nishino from Osaka University. It is a colorless solution containing silver and fluoride ions. [3]. SDF is regarded as a safe, effective, and economical approach for arresting the progression of dental caries [4]. Although SDF is available in various concentrations, 38% of SDF is most commonly used. Many studies have reported that an economical, simple, and non-invasive method to arrest dental caries is the application of the SDF [5,6]. Three possible mechanisms of action of cavity prevention activity of SDF have been described by Shimizu (1976). First, the silver ions and inorganic compounds of SDF support the obliteration of the dentinal tubules. Secondly, the reaction between SDF and tooth-mineral components produces calcium fluoride (CaF₂), which is responsible for cavity prevention, and silver phosphate (Ag₃PO₄) is for hardening

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dental caries. Third, SDF inhibits collagenase activity, hence preventing collagen degradation [7]. Horst et al. (2017) reported that SDF-treated lesions are resistant to the growth of biofilm, and the formation of more cavities occurs because of the residue of the silver ion. This is known as the “zombie effect”; the silver is reactivated when bacteria are killed by silver ions, which are mixed with living bacteria, and the dead bacteria can effectively kill the living bacteria [8]. The use of SDF for managing dental caries in both primary and permanent dentition is not a new concept in dentistry. However, it was only commonly used in the United States of America starting in 2014, when the use of SDF was cleared by the Food and Drug Administration (FDA) as an agent to treat tooth hypersensitivity and, in an off-label indication, for arresting the progression of cavities [9].

Being non-invasive, SDF is well-suited for caries control in young children who are non-cooperative during traditional dental procedures [10]. SDF is also cost-effective, with reduced instrumentation needs compared to traditional techniques [11]. Thus, this study aimed to evaluate the awareness, acceptance, and clinical utilization of SDF among dentists.

MATERIALS AND METHODS

An online cross-sectional study was conducted among dentists to assess their awareness, acceptance, and clinical utilization of SDF. A pre-validated and self-administered questionnaire was designed to evaluate the awareness, acceptance, and clinical utilization among dentists towards Silver Diamine Fluoride (SDF). An online multiple-choice questionnaire was created in Google Forms. The online form included three parts. The first part included awareness, the second part included acceptance, and the third part included clinical utilization of SDF by dentists. The results obtained were statistically analysed.

RESULTS

A total of 500 practicing dentists participated in this survey. Awareness of SDF amongst the dentists is shown in Table 1.

Table 1: Dentists' responses regarding awareness of Silver Diamine Fluoride (SDF)

Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	S.D
SDF can arrest the progress of a non-cavitated lesion	105 (21%)	165 (33%)	110 (22%)	60 (12%)	60 (12%)	2.61	1.27
SDF can arrest a cavitated lesion	130 (26%)	185 (37%)	100 (20%)	60 (12%)	25 (5%)	2.32	1.13
Placement of restoration is not necessary after SDF is used for arresting cavitated lesions	80 (16%)	185 (37%)	100 (20%)	110 (22%)	25 (5%)	2.62	1.13
SDF should be applied before restorations in all patients routinely	30 (6%)	100 (20%)	125 (25%)	170 (34%)	75 (15%)	3.32	1.12
SDF should be applied before placing all restorations in high caries risk patients	80 (16%)	115 (23%)	160 (32%)	95 (19%)	50 (10%)	2.83	1.19

Table 2: Dentists' Responses regarding Silver Diamine Fluoride (SDF) Acceptance

Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	S.D
SDF is a good treatment to be used for:							
Lesions not in the esthetic zone of primary teeth	85 (17%)	190 (38%)	140 (28%)	70 (14%)	15 (3%)	2.48	1.02
Lesions in the esthetic zone of primary teeth	35 (7%)	120 (24%)	155 (31%)	135 (27%)	55 (11%)	3.10	1.10
Lesions not in the esthetic zone on permanent teeth	80 (16%)	205 (41%)	130 (26%)	60 (12%)	25 (5%)	2.48	1.05
Lesions in the esthetic zone on permanent teeth	20 (4%)	75 (15%)	140 (28%)	170 (34%)	95 (19%)	3.49	1.08

Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	S.D
SDF is a good treatment to be used for:							
Alternative for restorations in children with behavioral issues	115 (23%)	195 (39%)	110 (22%)	55 (11%)	25 (5%)	2.35	1.09
When a patient wants a composite restoration in future but is unable to afford it currently	50 (10%)	170 (34%)	140 (28%)	115 (23%)	25 (5%)	2.78	1.06
When a patient wants an amalgam restoration later, but cannot afford it currently	45 (9%)	150 (31%)	155 (31%)	105 (22%)	35 (7%)	2.86	1.07
When patients are medically compromised	90 (18%)	180 (36%)	155 (31%)	50 (10%)	25 (5%)	2.33	1.04
When patients are unable to pay for restorations	55 (11%)	210 (42%)	125 (25%)	85 (17%)	25 (5%)	2.63	1.04
In patients with severe dental anxiety	90 (18%)	185 (37%)	135 (27%)	70 (14%)	20 (4%)	2.49	1.06
When undergoing or having recently undergone cancer therapy	85 (17%)	190 (38%)	145 (29%)	60 (12%)	20 (4%)	2.48	1.03
When patients take bisphosphonates	55 (11%)	155 (31%)	200 (40%)	65 (13%)	25 (5%)	2.70	0.99
If the patient needs general anesthesia for undergoing dental treatment	40 (8%)	145 (29%)	155 (31%)	115 (23%)	45 (9%)	2.95	1.09
If the patient cannot undergo a dental procedure under general anesthesia	85 (17%)	200 (40%)	140 (28%)	45 (9%)	30 (6%)	2.46	1.06
If lesions are in a hard-to-reach area in the oral cavity	60 (12%)	215 (43%)	165 (33%)	45 (9%)	15 (3%)	2.48	0.92

Table 3: Dentists' Responses regarding Silver Diamine Fluoride (SDF) Clinical Utilization

	Response options	Number of participants	Percentage
Table 3: Clinical Utilization			
Clinical Use Frequency	Rarely	152	30.4
	124	24.8	
Never	124	24.8	
Occasionally			
Regularly	100	20	
Reasons for Not Using SDF*	No clinical need	113	22.6
Product not available	50	10	
Patient rejection due to staining	97	19.4	
Other	93	18.6	
Lack of knowledge/training	147	29.4	
Preferred SDF Use#	Not applicable	105	21
	105	21	
Interim treatment before restoration	104	20.8	
For uncooperative children	102	20.4	
For geriatric patients			
In community outreach programs	84	16.8	
Patient Acceptance of SDF	Acceptable with explanation	142	28.4
Rejected outright			
Very acceptable	127	25.4	
Poorly acceptable	122	24.4	
	109	21.8	

*Asked of all respondents

#“Not applicable” reflects respondents for whom a preference did not apply/was not selected.

RESULTS

The survey evaluated awareness, acceptance, and clinical utilization of Silver Diamine Fluoride (SDF) among 500 dental professionals.

Awareness (Table 1): A substantial proportion agreed or strongly agreed that SDF is effective in arresting both cavitated (63%) and non-cavitated (54%) lesions. However, opinions were mixed on whether SDF should be used routinely before restorations, with 49% disagreeing or strongly disagreeing. The statement with the highest mean score (3.32) indicated disagreement with routine use before all restorations, showing resistance to overuse.

Acceptance (Table 2): SDF was most accepted for non-esthetic areas, particularly on primary (55%) and permanent teeth (57%). Acceptance declined significantly for esthetic zones, especially on permanent teeth, where 53% disagreed with its use. Notably, there was greater agreement for using SDF in medically compromised or behaviorally challenged patients—62% agreed on its use in such contexts (e.g., behavioral issues, dental anxiety, medical fragility).

Clinical Utilization (Table 3): Only 20% reported using SDF regularly, while 30.4% used it rarely, and 24.8% had never used it. The most cited reason for non-use was lack of knowledge/training (29.4%), followed by no clinical need (22.6%). The most preferred uses were interim treatment before restoration (21%) and for uncooperative children (20.8%). Patient acceptance was generally positive, with 28.4% finding it acceptable with explanation and 24.4% very acceptable.

DISCUSSION

The clinical use of SDF in caries management has a long-standing presence in dentistry, with the World Health Organization recommending it for arresting early childhood caries [12]. Despite increasing evidence of its benefits and higher efficacy relative to other topical fluorides, its adoption has not become universal globally. Many dental personnel may still lack exposure due to limited educational experience and a lack of familiarity with SDF use in everyday clinical practice. Knowledge of SDF has significant associations with the use of SDF and may lead to an increase in SDF use [13]. The findings of the current study reveal a moderate level of knowledge and selective acceptance of SDF among dental professionals. Most respondents understood the caries-arresting potential of SDF, especially in non-esthetic

contexts. However, concerns regarding esthetics and lack of routine training may be inhibiting its broader clinical use. The reluctance to use SDF routinely or in esthetically sensitive areas is consistent with known limitations such as staining, which in turn led to rejection from the patient (19.4%). Dental practitioners' attitude toward preventive dentistry plays an important role in influencing their decision to implement preventive treatments and their ability to motivate patients to seek preventive care [14]. This applies to SDF as well, reinforcing the need for its broader adoption. Attitude towards clinical utilization of SDF was seen to be lower in this study, which needs to be increased to achieve the proper benefits of SDF.

The high percentage citing lack of training suggests a need for curriculum integration and continuing education programs. Encouragingly, attitudes toward SDF are more favorable when treating special populations, indicating its perceived utility in specific clinical scenarios.

CONCLUSION

The findings from this survey revealed a useful picture of awareness, acceptance, and clinical utilization of SDF among dental personnel. Among Indian dentists, limited clinical utilization of SDF is evident despite generally favorable attitudes and stated willingness to adopt, with knowledge deficits identified as a key impediment to implementation. Educational interventions and clearer clinical guidelines could improve adoption, particularly in pediatric, geriatric, and medically compromised patient care. Beyond documenting current practices, this survey sensitized dentists to SDF and identified a clear need for dedicated courses and training modules to improve knowledge and implementation. SDF represents a cost-effective adjunct for community and outreach programs, supporting prevention, arrest of caries, and management of sensitivity. It may also serve as a valuable interim measure in primary care, either maintaining teeth until definitive treatment is accessible or until natural exfoliation occurs. Overall, SDF holds promise as a minimally invasive option, especially when traditional treatments are not feasible.

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