

The Older Adults' Intention to Use Silver Diamine Fluoride for Dental Caries Treatment

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Purpose: This study aimed to determine the intention of older adults to use silver diamine fluoride (SDF) for treating tooth decay.

Patients and Methods: A group of Thai-speaking individuals between the ages of 60 and 90 were asked to participate in the study. They were provided with information about SDF and then asked to complete a questionnaire based on the Theory of Reason Action (TRA). The questionnaire consisted of 23 questions divided into seven constructs aimed at determining the determinants of the intention to use SDF. These constructs were behavioral belief, evaluation of behavioral outcome, normative belief, motivation to comply, attitude towards behavior, subjective norm, and intention. The responses were rated on a 4-point Likert scale ranging from 1 (Strongly disagree) to 4 (Strongly agree). The characteristics and TRA scores of the participants were analyzed and compared based on their intention to use SDF, using the Chi-square test and *t*-test. Multiple logistic regression was employed to determine the determinants of the intention to use SDF.

Results: The study involved 588 participants, with an average age of 65.3 years (SD= 5.53). Of the participants, 52.7% were women, 58.1% were unemployed or retired, 80.8% lived with family, 63.4% had less than sixth-grade education, 62.9% had a monthly family income of less than 10,000 baht, and 63.6% had underlying diseases. The study found that 82.7% of the participants intended to use SDF for dental caries treatment, with an average score of 2.86 out of 4. The study also found that age, family income, underlying diseases, dental health problems, and fear of the dentist significantly affected their intention. Behavioral beliefs and evaluations of behavioral outcomes significantly affected the intention to use SDF treatment.

Conclusion: Most older adults in the study intended to use SDF for dental caries treatment.

Keywords: dental caries, older adults, intention, oral health literacy, silver diamine fluoride, Theory of Reason Action

Introduction

Older adults will likely develop oral health problems in the next few years. Systemic diseases in older adult patients can also complicate their general and oral health.^{1,2} Tooth decay is a leading cause of tooth loss among older adults. Tooth loss is the most significant negative impact on older adults' oral health-related quality of life.¹⁻³

Fluoride is an effective tooth decay-preventing substance. Various fluoride applications, such as fluoride varnish or different forms of sodium fluoride, have a topical effect on the tooth surface. Besides invasive procedures, non-invasive treatments such as silver diamine fluoride (SDF), Atraumatic Restorative Treatment (ART), and fluoride varnish are available for caries treatment.³ The primary mechanism of fluoride to prevent tooth decay is promoting remineralization and preventing demineralization of the tooth structure.^{4,5} SDF is an alternative form of topical fluoride that can arrest the progression of dental caries.

SDF has been proven effective for caries prevention and arrest among children and older adults.^{6,7} One disadvantage of the SDF treatment is the black staining on the decayed area after SDF treatment. Many studies revealed the acceptance of the staining of SDF treatment in children. The primary and the posterior teeth were more accepted than the permanent and the anterior teeth.^{7,8} Studies reported that the child's caregivers admitted the black stain after SDF treatment.⁸ The parents accepted the staining after SDF treatment in primary and posterior teeth rather than the stain in permanent and anterior teeth because they are less visible and beneficial for uncooperative children.^{8,9} Many parents prefer SDF

treatment to other alternative treatments under general anesthesia.^{8,9} Indications for SDF application include patients with high caries risk who have active cavitated caries lesions present with behavioral challenges or medical management, patients with multiple cavitated caries lesions that may not all be treated in one visit and have no signs of pulp inflammation or spontaneous pain.^{5,7,10} The patients should be informed and consent to the SDF treatment before the treatment, emphasizing the expected staining of treated lesions, potential staining on the skin, and clothing.^{7,11}

The Theory of Reason Action (TRA) aims to describe the relationship between attitudes and human behaviors. It predicts how a person will behave based on their attitude and intention. The decision to participate in a specific behavior depends on the individual's expected outcomes, as derived from previous research in social psychology.¹²⁻¹⁴ The TRA constructs included behavioral beliefs, evaluations of behavioral outcomes, normative beliefs, motivation to comply, attitude, and subjective norms.¹²⁻¹⁴ This TRA is suitable to explain the factors related to the intention of a specific behavior.

However, in Thailand, SDF is one method for treating tooth decay among older adults,^{11,15,16} but it needs to be better known. Recognizing this importance, the researcher aims to fill the knowledge gap. Unfortunately, there are very few studies on SDF treatment among older adults. The black staining on the carious teeth is noticeable, so older adults might have different perceptions of SDF treatment. Thus, this study applied the TRA to explore the decision on SDF treatment among older Thai adults. This study aimed to identify factors associated with the intention to use SDF for dental caries treatment among older adults, including behavioral belief, evaluation of the behavioral outcome, normative beliefs, motivation to comply, attitude, subjective norms, and intention to use SDF treatment.

Materials and Methods

Study Design and Participants

This study is a cross-sectional survey. Patients 60 years or older who could care of themselves and read Thai, attending the Faculty of Dentistry Hospital, Chulalongkorn University, and elders in Nakhon Pathom nursing home community were invited to participate in the study. They were excluded if they are unwilling to participate in the study. Data were collected from January 2022 to June 2022.

The calculated sample size, by G Power 3.1.9.6¹⁷ was 469 and compensating for estimated 20% incomplete information, the minimum required sample size was 563 participants. The *t*-test for calculating means: difference from constant (one sample case) were calculated with effect size = 0.15; α = 0.05; and power = 0.90.

Data Collection

Data was collected from January 2022 to June 2022. Information about SDF was provided through electronic posters on the following topics: 1) What is SDF? SDF is a dental treatment used to stop tooth decay. 2) What is the chemical reaction of SDF? The silver ions in SDF stop demineralization, prevent collagen degradation, and have a bactericidal effect. 3) What is the method of use? The steps for SDF application are explained. 4) What is the price? The application charge is covered under Thailand's Universal Coverage Scheme. 5) What are the advantages and disadvantages of SDF treatment? SDF is easy to use, painless, and inexpensive, but it may leave a black stain. The research team prepared an electronic questionnaire in simple language and with pictures to help older adults understand it better. The researchers accompanied the older adults during the survey to answer any questions they had. Participants were then asked to independently complete the questionnaire, designed based on the Theory of Reasoned Action (TRA), to measure their intention to use SDF treatment. The questionnaire consisted of 23 questions covering seven constructs related to the intention to use SDF treatment. The questionnaire used a 4-point Likert scale, with scores ranging from 1 to 4 (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree). Participants who answered "Strongly disagree" or "Disagree" to the intention question were categorized as "Not intending to use SDF".

The newly developed questionnaire was evaluated for its construct validity and reliability through exploratory factor analysis (EFA) and Cronbach's alpha coefficient. The results of EFA revealed that the final factors explained 77.82% of the variance, and the factor loadings of the statements ranged from 0.571 to 1.131 after rotation. The internal consistency of each factor, as indicated by Cronbach's coefficient, ranged between 0.87 and 0.95.¹⁸ Before participating in the study,

research participants signed a consent form and were informed about the research study, its aims, methods, data use and storage, voluntary identification, participation, and the right to withdraw from the study.

The study analyzed socio-demographic characteristics such as gender, occupation, highest education level, family income, diseases, daily activity, and pain experience, as well as the TRA construct which includes behavioral belief (BB), evaluation of behavioral outcome (EO), normative belief (NB), motivation to comply (MC), attitudes (AT), subjective norms (SN) and intention to use (I). Additionally, reasons for not intending to use SDF were examined. Descriptive statistics, IBM SPSS Statistics (Version 29, IBM), were used for the analysis. The Chi-square test was used to compare the participants' characteristics with different intentions, and the score distribution of each TRA question according to different intentions to use SDF was analyzed using the Chi-square test and *t*-test. Multiple logistic regression was employed to determine the effect of variables on the intention to use SDF.

Results

A total of 588 participants were recruited for the study. They are 60–90 years of age with average 65.3 (5.53) years of age. Most participants (86.1%) were 60–70 years old. The socio-demographic characteristics of participants are shown in Table 1. Half of the participants (52.7%) were female. Most participants (58.1%) were unemployed/retired, most (80.3%) stayed in house-with-family, 63.4% had a Grade 6 education or lower, and 14.1% had a bachelor's degree or higher. 62.9% of participants had a monthly family income of less than 10,000 Baht (300 US\$), 63.6% had underlying diseases, and hypertension is the most frequent underlying disease. Moreover, 80.6% of the participants reported having had dental problems, and 79.9% indicated they feared seeing a dentist (Table 1).

Table 1 Sociodemographic Characteristics and Comparisons of Different Intentions to Use SDF Among Different Characteristics

	Total		Intention to use SDF		No-intention to use SDF		P-value
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
	588	100	486	82.7	102	17.4	
Age (years) Mean (SD) = 65.30 (5.53); min, max = 60, 90			Mean (SD) = 65.33 (5.93)		Mean (SD) = 65.29 (5.44)		0.943 ^b
60–70	506	86.1	413	85.0	93	91.0	0.011 ^a
71–80	67	11.4	63	13.0	4	4.0	
81–90	15	2.6	10	2.0	5	5.0	
Gender							0.194 ^a
Male	278	47.3	223	45.9	55	53.9	
Female	310	52.7	263	54.1	47	46.1	
Occupation							0.325 ^a
Government officer/Employee	16	2.7	16	3.3	0	0	
Business owner	112	19.0	89	18.3	23	22.5	
Work for hire	81	13.8	68	14.0	13	12.7	
Retired	199	33.8	162	33.3	37	36.3	
Unemployed/Others	180	30.6	151	31.1	29	28.4	

(Continued)

Table 1 (Continued).

	Total		Intention to use SDF		No-intention to use SDF		P-value
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	
Residence							0.119 ^a
House-with-family	475	80.8	394	81.0	81	13.9	
House alone	113	19.2	92	19.0	21	3.6	
Highest education							0.058 ^a
Lower than Grade 6	373	63.4	318	65.4	55	53.9	
Upper than Grade 6	215	36.5	168	34.6	47	46.1	
Family income per month (10,000 Baht ≈ 300 US \$)							<0.001 ^a
Less than 10,000 Baht	370	62.9	328	67.5	42	41.2	
More than 10,000 Baht	218	37	158	32.5	60	58.2	
Underlying disease							<0.001 ^a
No underlying disease	214	36.4	203	41.8	11	10.8	
Having underlying disease	588	63.6	283	58.2	91	89.2	
Have you ever had dental problems?							<0.001 ^a
Yes	474	80.6	378	77.8	96	94.1	
No	114	19.4	108	22.2	6	5.9	
Fear of seeing a dentist							<0.001 ^a
Yes	470	79.9	372	76.6	98	96.1	
No	118	20.0	114	23.4	4	3.9	

Notes: ^aChi-square test; ^bIndependent t-test.

Four hundred eighty-six participants, which is 82.7% of the total, indicated their intention to use SDF for treating dental caries. The average age of participants who intended to use SDF (65.33 (5.93)) and who did not intend to use SDF (65.29 (5.44)) was not significantly different (*t*-test, $P=0.943$). However, a significant difference ($P=0.11$) was observed in the proportion of participants with different intention to use SDF. Almost all participants (91.0%) who stated no intention to use SDF were 60–70 years of age. The study revealed that age ($P=0.011$), family income ($P<0.001$), underlying disease ($P<0.001$), dental problem ($P<0.001$), and a fear of seeing a dentist ($P<0.001$) were the factors associated with the intention to use SDF. Participants who had a monthly family income of less than 10,000 Baht, had an underlying disease, dental problems, and feared seeing a dentist indicated an intention to use SDF.

The average mean (SD) score of the statement number 23, intention to use (I), is 2.86 (0.539) indicating the intention to use SDF. The average mean scores of each TRA variable ranged from 2.20 to 3.02. Most participants (52.7% to 76.7%) indicated they agreed with every statement except for the motivation to comply (MC) statements (statements 15 and 16). The majority of participants (51.9% to 52.6%) disagreed with statements 15 and 16. (Tables 2 and 3).

The average mean scores of each TRA statement among different intention to use SDF were statistically significant different ($P<0.001$). The difference ranged from 0.37 to 1.32 (data not shown). The MC statements revealed the least different scores (0.37 (Statement 16) and 0.46 (Statement 15)). The distribution of TRA variable scores according to different intentions to use SDF were statistically significantly different ($P<0.001$) in all statements of TRA variables except motivation to comply, both direct and indirect intention measurements. (Figures 1 and 2) Most participants who

Table 2 Score Distribution and Descriptive Statistics of Each TRA Question (Direct Measurement)

	Score ^a				Mean	SD	Median	Mode
	1	2	3	4				
Intention								
23. I intend to do the SDF treatment if I have cavities.	15	87	451	35	2.86	0.539	3.00	3
Attitudes								
17. Using the dental caries-stopping agent in the anterior teeth is acceptable	7	116	409	56	2.87	0.570	3.00	3
18. Using the dental caries-stopping agent in the posterior teeth is acceptable	26	98	407	57	2.84	0.645	3.00	3
19. I feel unacceptable with the black staining from the SDF treatment.	23	209	310	46	2.64	0.682	3.00	3
Subjective norms								
20. People who are important to me do not believe that SDF treatment can stop tooth decay.	39	136	382	31	2.69	0.673	3.00	3
21. People who are important to me think that fillings are better than the SDF treatment.	35	135	386	32	2.71	0.661	3.00	3
22. Someone who is important to me believes that the SDF is not a safe option	60	131	371	26	2.62	0.728	3.00	3

Notes: ^aScore: 1= Strongly Disagree; 2= Disagree; 3= Agree; 4= Strongly Agree.

Table 3 Score Distribution and Descriptive Statistics of Each TRA Question (Indirect Measurement)

Statements	Score ^a				Mean	SD	Median	Mode
	1	2	3	4				
Intention								
23. I intend to do the SDF treatment if I have cavities.	15	87	451	35	2.86	0.539	3.00	3
Behavioral belief								
1. SDF treatment can help stop tooth decay.	8	86	403	91	2.98	0.596	3.00	3
2. SDF treatment can help avoid the complications of dental procedures	25	70	396	97	2.96	0.673	3.00	3
3. Using SDF treatment can help save on dental expenses.	12	88	387	101	2.98	0.635	3.00	3
4. SDF treatment can help save time for dental treatment.	20	78	361	129	3.02	0.699	3.00	3
5. SDF treatment is safe.	27	80	391	90	2.93	0.684	3.00	3
6. SDF treatment can reduce the chances of toothache.	27	67	419	75	2.92	0.648	3.00	3
Evaluation outcome								
7. The benefit of SDF treatment is that it can stop tooth decay.	16	81	439	52	2.90	0.570	3.00	3
8. SDF treatment has the advantage of avoiding complicated dental procedures	12	79	445	52	2.91	0.545	3.00	3
9. An advantage of SDF treatment is that it can assist in lowering dental costs.	23	72	423	70	2.92	0.626	3.00	3

(Continued)

Table 3 (Continued).

Statements	Score ^a				Mean	SD	Median	Mode
	1	2	3	4				
10. Using SDF treatment to avoid complicated dental procedures is a good idea.	19	79	429	61	2.90	0.599	3.00	3
11. The benefit of SDF treatment is that it is safe.	24	70	427	67	2.91	0.624	3.00	3
12. SDF is an effective treatment for stopping tooth decay.	22	75	449	42	2.87	0.576	3.00	3
Normative beliefs								
13. People who are important to me do not want me to do the SDF treatment if I have cavities.	21	155	382	30	2.72	0.614	3.00	3
14. People who are important to me do not want me to do the SDF treatment due to the black staining.	39	132	388	29	2.69	0.667	3.00	3
Motivation to comply								
15. I will not do the SDF treatment when I have cavities if people who are important to me do not want me to do it.	69	309	204	6	2.25	0.666	2.00	2
16. I will not do the SDF treatment when I have dental caries if people who are important to me do not want me to do it due to the black staining.	84	305	194	5	2.20	0.683	2.00	2

Notes: ^aScore: 1= Strongly Disagree; 2= Disagree; 3= Agree; 4= Strongly Agree.

intended to use SDF agreed (strongly agree or agree) with TRA statements, while those who did not intend to use SDF disagreed (strongly disagree or disagree) with TRA statements.

It is noteworthy that despite having different intentions to use SDF, most of the participants disagreed (strongly disagree and disagree) with the MC statements. The study also found that some participants who intend to use SDF

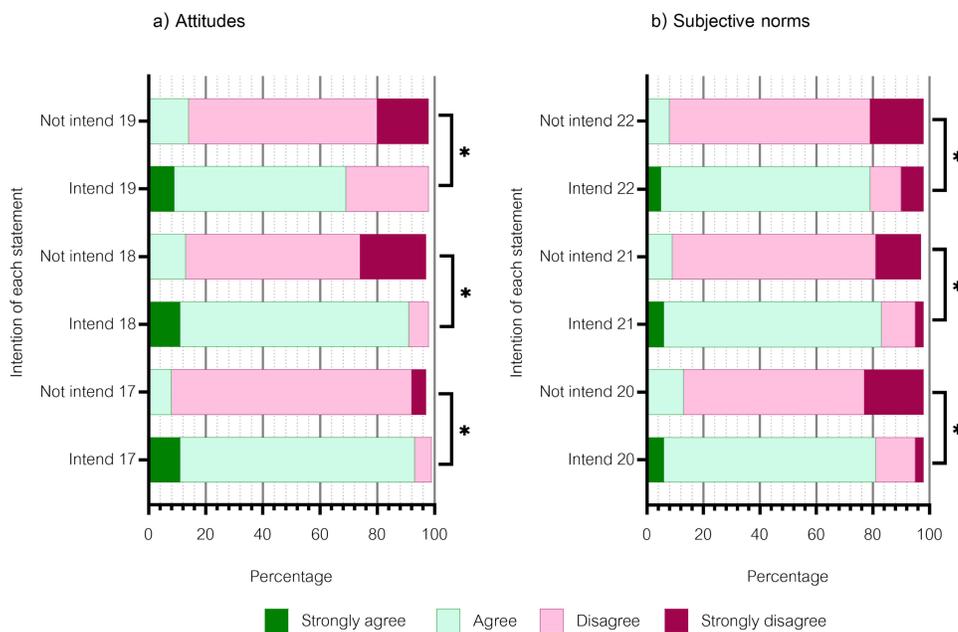


Figure 1 The proportion of responses to each statement among participants with different intentions for SDF treatment (Direct measurement); (a) Statements about attitudes towards SDF treatment; (b) Statements about subjective norms related to SDF treatment; *Chi-square test; p-value<0.05.

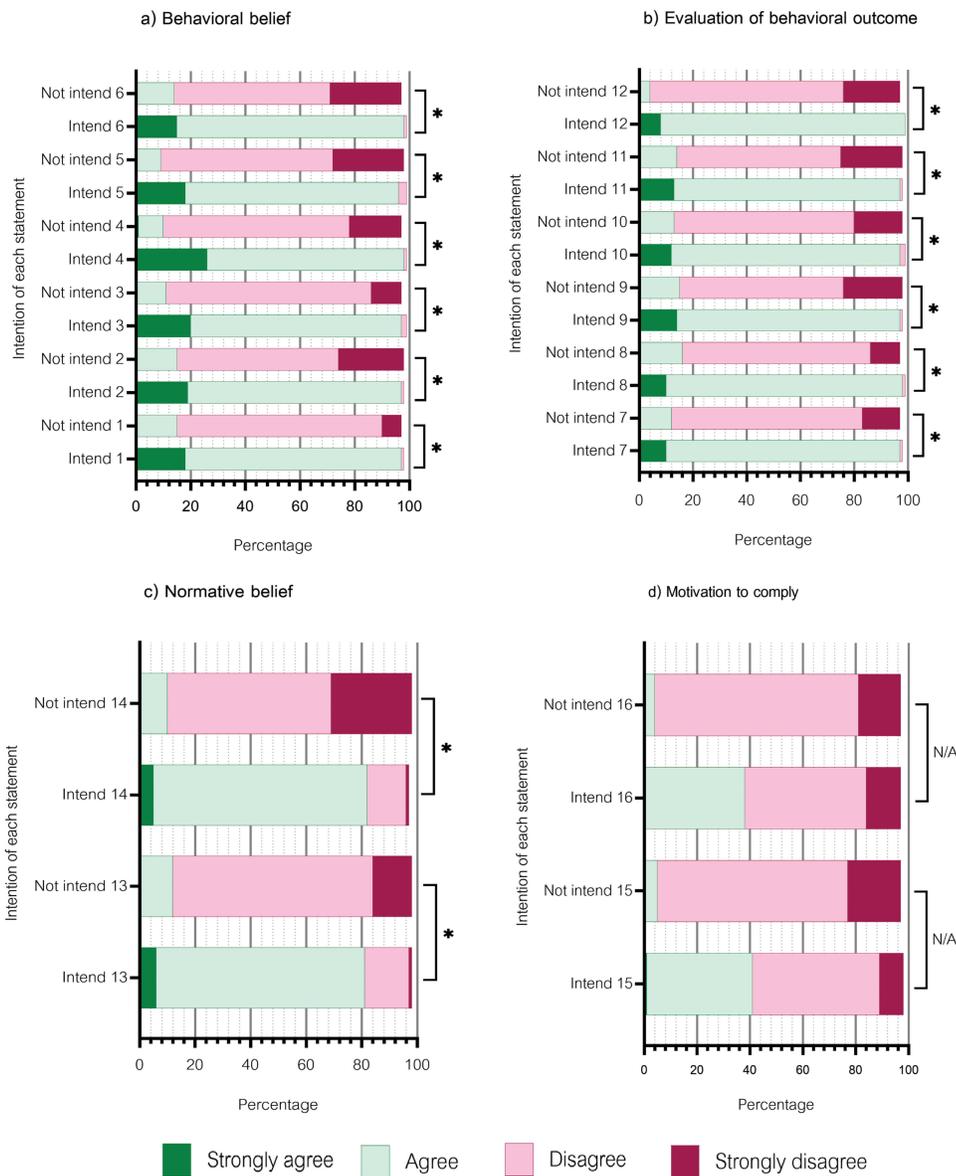


Figure 2 The proportion of responses to each statement among participants with varying intentions towards SDF treatment (Indirect measurement); (a) Statements about behavioral beliefs related to SDF treatment; (b) Statements about evaluation of the behavioral outcome of SDF treatment; (c) Statements of normative beliefs related to SDF treatment; (d) Statements about the motivation to comply with SDF treatment; *Chi-square test; p-value<0.05.

disagreed with TRA statements, while some participants who do not intend to use SDF agreed with TRA statements. It is interesting to note that over half of the participants disagreed with the MC statements.

Multivariate Analysis

Table 4 displays the adjusted multivariate models for the intention of older adults to use SDF treatment. When adjusting for the sociodemographic variables only (Model 1), age, income, lack of fear of seeing a dentist, having no dental problem, and having an underlying disease were found to have significant effects on the intention to use SDF treatment. Model 1 is capable of predicting correctly 84.4% with $-2 \text{ Log likelihood}^{\text{c}}$ ($-2LL$) 430.67, Nagelkerke R Square 0.288. Older adults aged 71–80 years intend to use SDF treatment 3.33 times more often than those aged 60–70 years. Older adults with lower incomes intended to use SDF treatment 4.30 times more often than those with higher incomes. Older adults with no fear of seeing a dentist intended to use SDF treatment 5.23 times more often than those with a fear of seeing a dentist. It was found that older adults with no dental problems were 3.95 times more likely to use SDF treatment

Table 4 Multiple Logistic Regression Models of Intention to Use SDF for Dental Caries Treatment by Sociodemographic and TRA Variables

Model	4			3			2			1		
Variables	B	P-value	OR _{adj}	B	P-value	OR _{adj}	B	P-value	OR _{adj}	B	P-value	OR _{adj}
Age												
60–70 years ^a		0.803			0.778			0.489			0.066	
71–80 years	4.304	0.557	73.959	4.351	0.535	77.569	0.858	0.328	2.357	1.202	0.029	3.326
81–90 years	3.109	0.753	22.403	3.059	0.726	21.316	−0.599	0.52	0.549	−0.457	0.475	0.633
Income												
More than 10,000 Bht/mth ^a												
Less than 10,000 Bht/mth	0.404	0.51	1.497	0.492	0.417	1.636	0.768	0.024	2.155	1.459	<0.001	4.303
Fears of seeing dentist												
Yes ^a												
No	0.723	0.437	2.061	0.84	0.352	2.316	1.606	0.025	4.985	1.654	0.003	5.23
Have ever had dental problems												
No ^a												
Yes	0.019	0.979	1.019	0.036	0.959	1.037	−0.4378	0.453	0.645	−1.374	0.003	0.253
Having underlying disease												
No underlying disease ^a												
Have underlying disease	0.426	0.558	1.531	0.339	0.635	1.404	−1.1754	0.007	0.309	−1.635	<0.001	0.195
Behavioral belief ^b	2.614	0.036	13.653	2.436	0.022	11.426						
Evaluation of behavioral outcome ^c	5.729	<0.001	307.797	6.018	<0.001	410.616						
Normative beliefs ^d	−0.182	0.741	0.834	−0.125	0.9812	0.882						

Motivation to comply ^e	-0.05	0.958	0.952	-1.008	0.129	0.365						
Attitudes ^f	0.117	0.693	1.194				1.688	<0.001	5.410			
Subjective norms ^g	-0.455	0.127	0.634				-0.578	<0.001	0.561			
Constant	-19.741	<0.001	0	-19.822	<0.001	0	-6.27	<0.001	0.002	2.921	<0.001	18.569
-2 Log likelihood ^h	96.99			99.21			249.77			430.67		
Cox & Snell R Square	0.531			0.53			0.392			0.173		
Nagelkerke R Square	0.882			0.879			0.651			0.288		
Overall percentage of correct prediction	96.9			96.8			92.0			84.4		

Notes: Variables: ^aReferences category. ^bBehavioral belief=MEAN (Statement 1–6); ^cEvaluation of behavioral outcome= MEAN (Statement 7–12); ^dNormative belief= MEAN (Reverse scores of statement 13–14); ^eMotivation to comply= MEAN (Reverse scores of statement 15–16); ^fAttitudes= MEAN (Statement 17–18, reverse scores of statement 19); ^gSubjective norms= MEAN (reverse scores of statement 20–22). ^hEstimation terminated at iteration number 10 because parameter estimates changed by less than 0.001.

Abbreviations: Bht/mth, Baht/month; OR_{adj}, odds ratio adjusted for the other predictors in the model.

Table 5 Reasons for Not Intending to Use SDF. (Only Participants Who Did Not Intend to Use SDF)

Reasons (N = 103)	Frequency	Percentage
SDF is not aesthetically pleasing	17	16.7
Lack of knowledge about SDF	38	37.3
Concerns about the safety of SDF	40	39.2
Belief that SDF cannot effectively stop tooth decay	55	53.9
Other reasons	20	19.6

than those with dental problems. Similarly, older adults without any underlying disease were 5.12 times more likely to use SDF treatment compare to those with an underlying disease.

Adjusting for the direct measurement of TRA variables (AT and SN) and sociodemographic variables (Model 2), it was concluded that income, lack of fear of seeing a dentist, absence of underlying disease, attitudes, and subjective norms were the crucial factors that influenced intention to use SDF treatment. Model 2 was able to predict with 92.0% accuracy with $-2LL$ 249.77, Nagelkerke R Square 0.651. The older adult with a positive attitude toward SDF intended to use SDF treatment 5.410 times more than those with a negative attitude. Interestingly, all the sociodemographic variables become non-significant in the model which was adjusted with indirect measurement of TRA variables (BB, EO, MC, and NB) in Model 3. Model 3 was able to predict with 96.8% accuracy with $-2LL$ 99.21, Nagelkerke R Square 0.879. The significant variables in this model were the behavioral belief and evaluation of behavioral outcome. The evaluation of SDF outcome had a very high impact on the intention to do SDF treatment (Adjusted OR = 410.6). Model 4, which was adjusted with sociodemographic variables, and all TRA variables, indicated only two variables, behavioral belief and evaluation of behavioral outcome, had significant effects on the intention to use SDF treatment. Model 4 was able to predict with 96.9% accuracy, with $-2LL$ 96.99, Nagelkerke R Square 0.882. In conclusion, older adults who have a positive belief towards SDF and a more positive evaluation of SDF treatment are highly likely to use the SDF treatment.

According to the study, out of 102 participants who had no intention of using SDF treatment, the reasons for their reluctance were as follows: SDF is not aesthetically pleasing (16.7%); lack of knowledge about SDF (37.3%); concerns about the safety of SDF (39.2%), belief that SDF cannot effectively stop tooth decay (53.9%); and other reasons (19.6%). (Table 5).

Discussion

According to the results, older adults have varying intentions when it comes to using SDF. Most of them plan to use SDF for dental caries treatment. Interestingly, the average age of participants with different intentions was similar. However, almost all (91%) of the participants who stated no intention to use SDF for dental caries treatment were aged 60–70 years old. This could be due to younger older adults being more active and independent, which allows them to receive extended periods of dental treatments without being hindered by travel constraints. Figures 1 and 2 indicate some participants who intended to use SDF treatment agreed with the negative statements, especially in MC statements. The study participants expressed their determination to use SDF treatment even though they faced opposition from those around them. Despite finding the black staining caused by SDF treatment unacceptable, they still intended to use it. Other factors might affect their intention, such as their socio-economic status, having an underlying disease or fear of seeing a dentist. They might have made this decision because they believed the treatment's benefits outweighed its drawbacks.

The study highlighted that the participant's beliefs about the treatment and their evaluation of its outcomes were the most important factors influencing their decision to use SDF. The study's findings suggest that the participants made informed decisions based on their evaluation of the treatment's benefits and their beliefs about it.

The analysis of the relationship between sociodemographic variables and the intention to use SDF treatment showed that several factors influence this intention, including age, income, presence of underlying diseases, fear of seeing a dentist, and

dental problems. On the other hand, the analysis of the relationship between TRA variables and the intention to use SDF treatment revealed that all TRA variables, except MC statements, play a significant role in shaping this intention. However, the multivariate analysis of the intention to use SDF treatment identified only two determining factors: the BB and EO statements. After taking into account the socio-demographics and all TRA variables, it was found that the evaluation of SDF treatment outcomes (EO) had a greater impact on the intention to use SDF treatment compared to other TRA variables. Participants who scored higher in positive BB and EO statements were more likely to have the intention to use SDF treatment. The best model for predicting the intention to use SDF treatment was model 3 due to its high overall percentage of correct prediction and low $-2LL$. Therefore, the BB and EO statements are the determinants of intention to use SDF treatment. Increasing awareness of the benefits of SDF for treating dental caries can improve its usage.

According to the study, the use of SDF among older adults is not very common. However, the results indicated that the majority of older adults (76.7%) agreed or strongly agreed (6%) with the statement “I intend to use SDF when I have cavities”, with a mean score of 2.86 (0.54). Only 16% of older adults showed no intention of using SDF to treat dental caries, as they either disagreed (14.8%) or strongly disagreed (2.6%) with the statement. Despite being a relatively new alternative procedure for dental caries treatment, almost all older adults (76.7%) had a positive attitude towards SDF treatment, as evidenced by their intention to use it.

Adhering to regulatory guidelines for treating dental caries is important. Silver diamine fluoride (SDF) treatment has shown to be highly effective, and it is included in the Thai Universal Coverage program’s list for all cases. The intention of patients to undergo SDF treatment depends on their evaluation of the positive outcomes of the treatment. SDF treatment is cost-effective and can save a lot of money compared to more complex treatments. This treatment can greatly benefit older Thai adults because 52.6% of 60–74-year-olds have dental caries, with an average of 1.8 teeth affected per person.¹⁹ By choosing SDF treatment, patients can save time and enable dental personnel to provide other necessary treatments to patients in need.

It has been observed that using SDF can be highly beneficial in stopping tooth decay quickly. This treatment not only decrease the time and cost involved in treating dental caries but also be helpful for older adults who would otherwise need to bear the expenses of traveling and out-of-pocket expenses for the same. Additionally, the shortage of dental personnel could be lessened, allowing dental health personnel to provide other necessary dental health services.¹⁵ Furthermore, 82% of participants who intended to undergo the SDF treatment considered the benefits of SDF over the black staining of SDF treatment. This consideration of the benefits of SDF is also indicated in the multivariate analysis. Evaluating behavioral outcomes became the most critical factor in deciding to use SDF treatment.

The use of SDF has been established as a highly effective solution for treating dental decay in older adults.²⁰ A study conducted on children has further confirmed the success of this treatment.²¹ The research revealed that the acceptability of SDF treatment increased as the child required more advanced methods of behavior guidance.²¹ Parents were also found to accept the pigmentation caused by SDF,²¹ a common side effect of the treatment. Based on the comparison of the results with another study, it was found that older adults also had similar positive and negative views regarding the SDF treatment. The discoloration caused by SDF was observed to be less of a concern when it was applied to less visible areas. Furthermore, the participants preferred it as it helped them avoid pain or complicated dental procedures, and its discoloration was overcome with the advantage.²² That study also indicated that older adults found SDF treatment to be valuable for people who are immobile or in need of care.²² SDF treatment is a non-invasive and easy-to-perform dental procedure that requires minimal time and budget, making it an excellent option for reducing barriers to dental health services.^{23,24} Thailand’s universal health coverage covers SDF treatment, but it’s not widely used in the country. Therefore, it’s important to raise awareness about the benefits of SDF treatment. A study shows that people still need to be convinced of its effectiveness, even after receiving additional information about it. Encouraging SDF treatment among older adults will improve their quality of life by reducing tooth loss and saving the time and cost of dental caries treatment.

Limitation

This study is focused on the intention to use SDF treatment, which may not necessarily reflect the actual rates of SDF treatment. However, the results of the study can be used to promote the benefits and safety of SDF and encourage its use for dental caries treatment. A further study that examines short-term and long-term SDF treatment satisfaction would be beneficial to dental health professionals and the elderly, making it more widely used in routine practice. It is also

important to acknowledge the potential for unconscious bias when analyzing statements, as there is a trend of most people who agree to use SDF also agree with all the other statements, including negative ones.

Conclusion

After receiving the essential information about the SDF treatment, most Thai older adults indicated an intention to use SDF treatment. Factors influencing different intentions were the belief and evaluation of SDF treatment's outcomes.

Abbreviations

SDF, Silver diamine fluoride; DMFT, average number of decayed, missing, filled teeth; SD, Standard deviation; TRA, Theory of Reason Action; BB, Behavioral belief; EO, Evaluation of behavioral outcome; NB, Normative belief; MC, Motivation to comply; AB, Attitude towards behaviors; SN, Subjective norm; I, intention.

Data Sharing Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Informed Consent

The research has been conducted following the guidelines in the Declaration of Helsinki. The Faculty of Dentistry's Committee on Human Research at Chulalongkorn University approved the study (HREC_DCU 2017-084) in accordance with ethical standards. The participants gave written informed consent. Notifying participants of the study's details before data collection begins is crucial. Participation in the research is voluntary, and the participants were informed that they could withdraw from the study or complete the questionnaire at any time. By filling out the self-administered questionnaire, the participants agreed to participate in the study.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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