Knowledge, Attitude and Barriers to Fluoride Treatment Use Among Peoples

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ABSTRACT

Background: Fluoride is a cornerstone of preventive dentistry, playing a vital role in maintaining oral health. Its ability to strengthen tooth enamel, enhance remineralization, and inhibit bacterial activity makes it indispensable in protecting teeth from decay. The aim of study to assess the knowledge level, attitudes and barriers of patients toward fluoride treatments.

Method: Stratified random sampling was chosen to ensure representativeness by dividing participants into subgroups based on age and gender, followed by random selection within each group. Data collection was done through a structured questionnaire developed to assess participants knowledge of fluoride treatments, their attitudes toward fluoride use and the barriers they perceived to using fluoride treatments. Correlation analysis to assess the relation between Knowledge, attitude and demographic factors regarding fluoride treatment. Odd Ratios wit 95% confidence intervals were calculated to identify barriers to fluoride treatment. Statistically significant level was defined as less than 0.05 probability.

Results: The study showed that 77.9% of participants had never heard about fluoride treatment and 91% lacked knowledge about its benefits. The most significant barriers to fluoride use were a lack of knowledge 48.1% and the absence of dentist recommendation 37.6%. Correlation analysis showed that education had the strongest positive relation with fluoride knowledge r = 0.46, P= 0.001. Logistic regression indicated that knowledge OR = 2.4, P = 0.0001 and barriers to fluoride use OR = 3.0, P = 0.0001 were strong predictors of willingness to receive fluoride treatment.

Conclusion: Addressing these barriers through education, financial support and accessibility improvements will be crucial in increasing fluoride utilization and enhancing oral health outcomes.

KEYWORDS

Fluoride awareness, dental public health, willingness use of fluoride, fluoride safety, access to fluoride treatment

INTRODUCTION

Fluoride is a cornerstone of preventive dentistry, playing a vital role in maintaining oral health. Its ability to strengthen tooth enamel, enhance remineralization, and inhibit bacterial activity makes it indispensable in protecting teeth from decay[1]. Fluoride works by forming fluorapatite, a mineral that is more resistant to acid attacks than hydroxyapatite, the natural component of enamel[2]. It also facilitates the repair of early demineralized areas, reversing initial stages of dental caries before cavities form. Fluoride can be delivered systemically through water fluoridation or topically via toothpaste, mouth rinses, and professional treatments. Proper fluoride use ensures healthier teeth, reduces the need for restorative treatments, and contributes to long-term oral health[3]. Fluoride significantly reduces the prevalence of dental caries and enhances oral health outcomes by addressing both the causes and effects of tooth decay. It strengthens enamel, protects against acid erosion, and promotes the remineralization of early carious lesions[4]. Fluoride's antibacterial properties

inhibit the metabolic activity of cariogenic bacteria such as Streptococcus mutans, reducing acid production and bacterial adhesion(5). Community water fluoridation is a highly effective public health measure, reducing caries incidence by approximately 25% in populations with access to fluoridated water. For individuals, the regular use of fluoride-containing products like toothpaste and mouthwashes provides additional protection(6). By minimizing cavities and the associated complications, fluoride also improves overall quality of life, prevents tooth loss, and reduces the financial burden of dental treatments(7). Globally, fluoride is widely recognized as a key tool in improving oral health. Organizations like the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) advocate for community water fluoridation as one of the most cost-effective public health strategies to prevent dental caries(8). Many developed countries, including the United States, Canada, and Australia, have implemented water fluoridation programs with significant success in reducing caries prevalence(9). However, challenges remain in low- and middle-income countries due to limited access to fluoridated water or fluoride-containing products(10). From a local perspective, fluoride use may vary based on regional policies, water fluoridation availability, and public awareness. In areas with naturally high fluoride levels in water, communities may face risks of dental or skeletal fluorosis, highlighting the need for careful monitoring and tailored approaches(11). Education campaigns and professional guidance are critical in encouraging proper fluoride use to maximize benefits while minimizing risks. By addressing local challenges and promoting equitable access, fluoride can continue to play a transformative role in improving oral health worldwide(12). Understanding patients' knowledge, attitudes, and barriers regarding dental health practices is critical for improving oral health outcomes. Patients' awareness and perceptions significantly influence their adherence to preventive measures such as regular brushing, flossing, and the use of fluoride(13). Knowledge gaps, misconceptions, or negative attitudes toward dental care can result in inadequate oral hygiene, increased risk of dental diseases, and higher healthcare costs. Furthermore, identifying barriers—whether financial, cultural, or psychological—can help healthcare providers tailor interventions to address specific challenges faced by different populations(14). The aim of study 1- to assess the knowledge level and attitudes of patients about fluoride treatments. 2- To evaluate patient attitudes toward fluoride use. 3- To identify barriers preventing the utilization of fluoride treatments.

METHOD

Our study designated by a cross sectional survey to assess the knowledge, attitude and barriers regarding fluoride treatments among patients visiting a dental clinic. The target population consist of patients attend to my clinic for routine dental check-up or treatments. A simple random selection method was used to select participants from clinic patient records to ensure fair representation of the sample. The sample size was determined using Cochran's formula, considering 95% confidence level, 50% estimate prevalence and 5% margin of error, resulting in a required sample of 385 participants. Stratified random sampling was chosen to ensure representativeness by dividing participants into subgroups based on age and gender, followed by random selection within each group. This method enhances the reliability and generalizability of the results while minimizing selection bias. The construct definition was used to assess the validity. Out of the twelve items. Six received a perfect score while four received a score of five and were eliminated due to being perceived as irrelevant to the study's objectives by the participants. Subsequently, the validated survey was administered again to the same groups of ten participants and all participant answered all twelve questions correctly. The questionnaire used in this study was composed 17 questions divided to four sections. The first section included questions about participant demographics, education, occupation and income level. The second, third, focus on the participants knowledge, attitudes toward fluoride and its application. The fourth section about barriers to fluoride treatment utilization. Data collection was done through a structured questionnaire developed to assess participants knowledge of fluoride treatments, their attitudes toward fluoride use and the barriers they perceived to using fluoride treatments. The questionnaire included closed-ended, multiple- choice questions, focusing on frequency of fluoride use, perceived benefits, safety concerns and barriers to access. The questions are designed to be clear, concise and easy to understand, ensuring the can be understood by individuals with different cultural and educational backgrounds. Before administering the survey, I

explained the purpose and procedures of the study. Informed consent was obtained from all participants before their participation in the study. I then asked the clinic participants questions, which they answered honestly and to the best of their abilities. Data collection took place over the course of 6 months, with question asked during patients visits to the clinic. The collected data were analyzed using descriptive statistics to summarize participants knowledge, attitudes and barriers toward fluoride treatment. Correlation analysis to assess the relation between Knowledge, attitude and demographic factors regarding fluoride treatment. Odd Ratios wit 95% confidence intervals were calculated to identify barriers to fluoride treatment. Additionally, a logistic regression analysis was conducted to predict the willingness to receive fluoride treatment based on various influencing factors. Statistically significant level was defined as less than 0.05 probability.

RESULTS:

The demographic characteristic of the participants are summarized in table 1, displaying a diverse sample. The predominant of participants were aged between (31-50) years (41.6%), with a relatively balance gender distribution 53.2% female and 46.8% male. The education level varied, with 31.2% having completed secondary school 28.6% holding an undergraduate and 13% having postgraduate education. In term of occupation, most participants were professional 39%, followed by students 23.4%. Regarding income 46.8 % reported a middle income status, while 36.4% under the low income category and 16.9 % were classified as high income category. Table 2, displaying knowledge, attitudes and barriers toward fluoride treatments. A significantly majority of participants 77.9% hadn't heard of fluoride treatments, with 91% does not understanding fluoride role in prevent caries, although very fewer

recognized benefit of fluoride in prevent of dental caries, strength and whiting teeth 3.8 %, 2.6 %, 2.6 % respectively. When it comes to frequency of fluoride application, 2.6% applied fluoride every 3-6 month, while 5.2% did so annually. However, a concerning portion 91% was unsure about the frequency of fluoride treatments. The correlation analysis in table 3, highlights significant relationships between certain demographic factors and knowledge and attitudes regarding fluoride. Education level had the strong relation with fluoride knowledge (r = 0.46, P< 0.001), while age and income show moderate correlation with knowledge and predisposition to receive fluoride (r = 0.23, r = 0.27, P= 0.01, 0,03) respectively. Moreover, occupation was significantly correlated with attitude towards fluoride treatment (r =0.32, P = 0.02), suggesting that professional individuals may have more favorable attitudes toward fluoride treatment. Table 4 shows the odd ratio for the barriers to fluoride treatment. Lack of knowledge emerged as the most significant barrier (OR= 3.1, P = 0.0001), followed by not recommended by dentist (OR = 2.3, P = 0.001) and Concerning about safety (OR = 2.0, P = 0.002). These results underscore the need for target education campaigns and efforts to reduce perceived concerns that prevent access to fluoride treatment. Table 5, summarizes the findings of logistic regression analysis predicting the predisposition to receive fluoride treatment. Key predictors include education, occupation, income, knowledge about fluoride and attitude towards fluoride. The strong predictor was knowledge about fluoride (adjusted OR = 2.4, P = 0.0001), indicating that individuals with better knowledge are more likely to accept fluoride treatments. Furthermore, barriers to fluoride use had the highest adjusted odd ratio (OR = 3.0, P = 0.001), emphasizing that addressing barriers could significantly improve fluoride uptake.

Table 1: Demographic characteristic of participants.

Variable	Categories	Frequency (n)	Percentage (%)
Age	< 18 years	30	7.8
	18- 30 years	140	36.4
	31- 50 years	160	41.6
	> 50 years	55	14.2
Gender	Male	180	46.8

	Female	205	53.2
Educational level	No education	25	6.5
	Primary school	80	20.8
	Secondary school	120	31.2
	Undergraduate	110	28.6
	Postgraduate	50	13.0
Occupation	student	90	23.4
	Professional	150	39.0
	Homemaker	50	13
	Unemployed	95	24.6
Income	Low	140	36.4
	Middle	180	46.8
	High	65	16.8

Table 2: Knowledge, attitudes and barriers regarding fluoride treatments

Question	Response categories	Frequency (n)	Percentage (%)
Heard about fluoride treatment	Yes	85	22.1
	No	300	77.9
Knowledge about fluoride use	Preventive caries	15	3.8
	Strength teeth	10	2.6
	Whiting teeth	10	2.6
	Do not know	350	91
Frequency of fluoride application	Once a month	5	1.2
	Every 3-6 month	10	2.6
	Once a year	20	5.2
	Do not know	350	91
Barrier factor	Lack of knowledge	185	48.1
	Not recommended by dentist	145	37.6
	Concerning about safety	35	9.1

	Cost of treatment	10	2.6
	Accessibility issues	10	2.6

Table 3: Correlation analysis between knowledge, attitudes and demographics

Variables	Person correlation (r)	P-value
Age vs. Knowledge about fluoride	0.23	0.01
Education vs. Knowledge about fluoride	0.46	0.001
Occupation vs. attitude toward fluoride	0.32	0.02
Income vs. to receive fluoride	0.27	0.03

Table 4: Odd ratio and 95% confidence intervals for barriers to fluoride treatment.

Barrier factor	Odd Ratio	Confidence interval 95 %(lower- Upper)	P-value
Cost of treatment	1.5	1.0- 2.3	0.04
Lack of knowledge	3.1	2.0- 4.8	0.0001
Concerning about safety	2.0	1.4- 3.0	0.002
Not recommended by dentist	2.3	1.5- 3.6	0.001
Accessibility issues	1.8 2.0	1.2- 2.7	0.006

Table 5: Logistic regression analysis predicting willingness to receive fluoride treatment.

Predictor Variable	Adjusted OR	CI (Lower- Upper)	P-value
Age	1.2	1.0 - 1.5	0.03
Gender	1.1	0.9 – 1.4	0.2
Educational level	2.0	1.5- 2.7	0.001
Occupation	1.8	1.3 – 2.5	0.002
Income	1.5	1.1 – 2.0	0.02
Knowledge about fluoride	2.4	1.8 -3.2	0.0001
Attitude toward fluoride	1.9	1.4 – 2.6	0.003
Barrier to fluoride use	3.0	2.2 – 4.1	0.0001

DISCUSSION

The findings from our study provide a comprehensive insight into the factors affecting the use of fluoride treatment by participants. A few notable results include strong relation between education, income, attitudes and knowledge about fluoride, as well as the identification of significant barriers to fluoride use, including lack of knowledge, Concerning about safety, not recommended by dentist, cost and accessibility. These results are agreement with previous researches that have explored similar themes in the context of public dental and health care(15,16). Our results indicate low level of awareness and knowledge about fluoride treatment, with only 9% of participants having heard of fluoride treatment and 91% being unaware of its purpose. This agreement with previous studies that have reported limited public knowledge regarding fluoride and its benefits in preventing dental caries. For example, a research by Petersen 2016 found that public awareness of fluoride role in decay prevention was more than 30% in several developing countries, highlighting a gap in preventive dental education(17). Similarly, a research by Gussy et al. 2008, emphasized that inadequate knowledge about fluoride is a major challenge in achieving effective preventive care, particularly among populations with limited access to dental services(18). A notable misconception in our study is that 2.6% of participant incorrectly associated fluoride with teeth whitening rather than prevent caries. This is agreement with results from McDonagh et al. 2000, which suggested that public misconceptions about fluoride often stem from marketing messages promoting fluoride-based whitening toothpaste, rather than its primary role in strengthening enamel and reducing risk of caries. Addressing these misconceptions through targeted public health campaigns is essential to improve fluoride literacy(19). Our study also highlights that 91% of participants did not know the appropriate frequency for fluoride application. In compared, studies from Griffin et al. 2001 and Marinho et al 2013, emphasize the importance of regular fluoride application every 3-6 month in caries prevention, especially among high risk individuals. The absence of knowledge regarding proper use of fluoride suggests a need for improved educational interventions by healthcare professional(20, 21). Our findings identified lack of knowledge about fluoride (48.1%) and lack of dentist recommendation(37.6%) as the main barriers to fluoride use, agreement with

previous researches. This highlights the need better public education and protective counseling by dentist(22). Regarding about safety 9.1% were reported less frequently then in some previous study, suggesting improved public perception but still requiring efforts to address misinformation(23). Cost 2.6% was a minor barrier, agreement with study in well-served populations thought it remains a concern in low income settings(24). Accessibility issues 2.6% were minimal compared to findings by Muñoz-Millán et al. 2018, indicating adequate fluoride availability in the studied population(25). The correlation analysis in table 3, demonstrates that education (r = 0.46, P = 0.001) had the strong relation with fluoride knowledge . This agreement with results from Mbawalla and Sabasaba 2022, which reported that higher education levels associated with increased awareness and acceptance of fluoride treatments(26). Furthermore, income was significantly correlated with willingness to receive fluoride treatment (r = 0.27, P = 0.03), reinforcing economic disparities as a critical factor in preventive dental care access(Peres et al. 2019), (27). The Odd ratio analysis in table 4 highlights the significant barriers to fluoride treatment, with absence of knowledge (OR = 3.1, P = 0.0001) being the most influential factor. This findings is agreement with researches by Gussy et al. 2008 and Akbar et al 2018, which emphasized that lack of knowledge prevents individuals from seeking fluoride treatment, even when it is accessible(18,28). The logistic regression analysis in table 5 provides valuable insights into predictors of fluoride acceptance. Educational level OR = 2.0, P = 0.001 was of the strongest predictors, reinforcing the idea that individuals with higher education levels are more likely to understand and accept fluoride treatment. This is agreement with Mbawalla and Sabasaba 2022, who found a direct correlation between education and dental health awareness(26). Income OR = 1.5, P = 0.02 was also a significant predictor, supporting the idea that affordability influences willingness to receive fluoride treatment, as reported by Ko and Thiessen 2015 (29). Knowledge and attitude toward fluoride treatment (OR = 2.4, P = 0.0001, OR = 1.9, P = 0.003) respectively, were strong predictors of willingness, indicating that public perception plays a important role. This agreement with study conducted by Marinho et al 2013, which found that individuals with positive fluoride attitudes were more likely to engage in preventive dental behaviors(21). Barriers to fluoride use OR = 3.0, P = 0.0001 had the

highest impact on willingness to receive fluoride treatment, further confirming that reducing barriers is key to increase fluoride adoption.

RECOMMENDATIONS

1- Increase fluoride education through public health campaigns.

2- Encourage dentists to routinely recommend fluoride use.

3- Dispel safety concerns by providing evidence-based information.

4- Ensure fluoride affordability for lower income populations.

5- Expand fluoride access in underserved area through community programs.

CONCLUSION

The our results reaffirm existing research that knowledge and professional recommendations are key determinants of fluoride treatment adoption. Addressing these barriers through education, financial support and accessibility improvements will be crucial in increasing fluoride utilization and enhancing oral health outcomes.

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Questionnaire: Assessing Knowledge, Attitudes, and Barriers Regarding Fluoride Treatments

Section 1: Demographic Information

1. **Age:**
   - ( ) <18
   - ( ) 18–30
   - ( ) 31–50
   - ( ) >50
2. **Gender:**
   - ( ) Male
   - ( ) Female
3. **Education Level:**
   - (1) No formal education
   - (2) Primary school
   - (3) Secondary school
   - (4) Undergraduate degree
   - (5) Postgraduate degree
4. **Occupation:**
   - (1) Student
   - (2) Professional/Employed
   - (3) Homemaker
   - (4) Retired
   - (5) Unemployed
5. **Income (optional):**
   - ( ) Low-income
   - ( ) Middle-income
   - ( ) High-income

Section 2: Knowledge about Fluoride Treatments

1. Have you heard about fluoride treatments before?
   - Yes
   - No
2. What do you think fluoride treatments are used for? (Select all that apply)
   - Preventing cavities
   - Strengthening teeth
   - Whitening teeth
   - Don't know
3. How often should fluoride treatments be applied?
   - Once a month
   - Every 3-6 months
   - Once a year
   - Don't know
4. Do you know that fluoride is available in products like toothpaste and mouthwash?
   - Yes
   - No

Section 3: Attitudes toward Fluoride Use

5. Do you believe fluoride treatments are important for dental health?
   - Strongly agree
   - Agree

- o Neutral
- o Disagree
- o Strongly disagree

6. Are you willing to receive fluoride treatments during your dental visits?
    - o Yes, always
    - o Yes, sometimes
    - o No, never

7. Do you think fluoride treatments are safe?
    - o Yes
    - o No
    - o Not sure

8. Do you think fluoride treatments are necessary for children's dental health?
    - o Strongly agree
    - o Agree
    - o Neutral
    - o Disagree
    - o Strongly disagree

Section 4: Barriers to Fluoride Treatment Utilization

9. What prevents you from using fluoride treatments? (Select all that apply)
    - o Cost of the treatment
    - o Lack of knowledge about fluoride
    - o Concerns about safety
    - o Not recommended by my dentist
    - o I don't think it's necessary
    - o Other (please specify): _____

10. Do you find fluoride treatments difficult to access in your area?

- Yes
- No

11. Do you feel that your dentist provides enough information about the benefits of fluoride treatments?

- Yes
- No

12. What would encourage you to use fluoride treatments more frequently?

- Lower cost
- More information about its benefits
- Dentist recommendations
- Other (please specify): _____