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Knowledge, Attitudes, and Practices of Iranian Dentists about Fluoride Application in Caries Prevention Strategies

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Abstract

Objective(s): Dental caries remains a prevalent chronic disease globally, with fluoride being a cornerstone in its prevention. Despite its proven efficacy, the implementation of fluoride-based strategies depends heavily on dentists' knowledge, attitudes, and practices. This study assessed the knowledge, attitudes, and practices of Iranian dentists concerning fluoride application, as well as the barriers to its use. **Methods:** A cross-sectional study was conducted among a convenient sample of 296 dentists. A validated questionnaire was used to collect data on dentists' age, gender, dental specialty, working sectors and queries, such as the availability of specific guidelines for prescribing fluoride products in the workplace, self-reported practices regarding fluoride application, perceptions of barriers to fluoride use and level of agreement with statements regarding the effectiveness of fluoride in caries prevention. Descriptive statistics and chi-square tests were employed to summarize and compare responses based on demographic and professional characteristics at $p<0.05$. **Results:** 40% of dentists had access to fluoride prescription guidelines. Younger dentists and those in both public and private sectors were more likely to report guideline availability. While 73-97% of dentists agreed with the effectiveness of fluoride in caries prevention, only 50% recognized its benefits for individuals over 12 years old. Fluoride application was more prevalent for children under 12 (30-35%), compared to adults (10%). Barriers to fluoride use included low treatment tariffs (45%), skepticism about its effectiveness (42%), and time constraints (25%). Dentists favored restorative treatments for high-risk cases, with 80% recommending fluoride varnish and gel for children but fewer for adults. **Conclusion:** This study highlighted gaps in knowledge and practice regarding use of fluoride among Iranian dentists, particularly for adult patients. Barriers such as low reimbursement rates and skepticism about fluoride's effectiveness need to be addressed. Enhanced training, standardized guidelines, and policy interventions are essential to improve fluoride application efforts in Iran.

Keywords: Fluorides; Dental Caries; Health Knowledge; Attitudes; Practice; Dentists; Practice Guidelines as Topic

Introduction

Dental caries remains one of the most prevalent chronic diseases worldwide, with significant implications for both individual health and public healthcare systems [1]. Fluoride has long been recognized as a cornerstone in caries prevention, with its efficacy well-documented in reducing the incidence of dental decay across all age groups [2, 3]. Economic evaluations have also underscored the cost-effectiveness of fluoride varnish in preventing caries among preschoolers [4] and schoolchildren [5].

Despite strong recommendations from professional organizations [2] and the availability of insurance coverage for fluoride treatments, the application of fluoride products remains low in medical settings, highlighting a persistent reluctance among healthcare professionals to adopt this preventive measure. For example, Tandon et al., [6] observed a very low prevalence of fluoride application (about 2% in 2021) within a tertiary care center in Iowa, USA. Similarly, Ko et al., [7] found that among all fluoride prescription for Medicaid-enrolled children in Oregon, USA, 41% were made by pediatricians and only 23% were made by dentists.

Despite its proven benefits, the effective implementation of fluoride-based preventive strategies relies heavily on the knowledge, attitudes, and practices of oral health care providers, particularly dentists [8]. Understanding how dentists perceive and utilize fluoride products is critical for optimizing caries prevention efforts and improving community oral health outcomes [9].

In Iran, multiple studies have explored dentists' knowledge, attitudes, and practices concerning fluoride use. A research in Isfahan highlighted a discrepancy between dentists' awareness of fluoride-containing preventive materials and their routine prescription [10]. A study on self-reported knowledge and attitudes among Iranian dentists showed that while 85% recognized fluoride's role in caries prevention, only 60% consistently incorporated fluoride products into their practice, citing barriers such as patient non-compliance

and inadequate clinical guidelines [11]. Another study focusing on health personnel in primary school fluoride varnish programs found that only 40% had received formal training on fluoride varnish application, with 65% expressing a need for further education [12]. Additionally, a research revealed that 34% to 70% of Iranian dentists prescribed fluoride mouthwash or applied fluoride gel, varying by patients' caries risk [13].

Previous studies have explored various barriers and challenges associated with the use and application of fluoride in dental practice such as a lack of awareness, inadequate training, and insufficient guidelines [14]. Another study identified that the application of fluoride varnish is hindered by a variable interpretation of guidelines, persistent myths about fluoride risks, and significant logistical challenges in treating children. They found that practitioner beliefs, clinical judgment, and patient preferences were often stronger drivers for application than research evidence alone [15].

Despite the global recognition of these barriers, there is a scarcity of comprehensive research within the Iranian context that simultaneously evaluates the knowledge, attitudes, and practices of dentists regarding fluoride and links these factors to the specific obstacles they face. Understanding this interplay is crucial for developing targeted interventions that are culturally and contextually relevant to the Iranian healthcare system.

The present study; therefore, aimed to investigate the knowledge, attitudes, and practices of Iranian dentists regarding the prescription of fluoride products and to identify barriers to its effective use in clinical practice. Specifically, the research seeks to answer the following questions: (1) What is the level of knowledge among Iranian dentists regarding fluoride-based preventive measures? (2) What are the prevailing attitudes toward fluoride prescription? (3) What barriers exist to the effective use of fluoride products in dental practice? By exploring these questions, the study hopes to identify key areas for improvement in dental education and practice, ultimately contributing to enhanced caries prevention efforts and better oral health outcomes in the Iranian community. The findings will also provide a foundation for developing targeted interventions and guidelines to support dentists in optimizing fluoride use in clinical practice.

Methods

Study design and population

The target population for this cross-sectional study comprised dentists who attended the Iranian General Dentists Congress in April 2015. The convenience sampling method was used to select the dentists. Based on an assumption that 50% of dentists exhibit high knowledge levels, the sample size was calculated to ensure a 95% confidence level with a margin of error below 6.25%. Using the standard formula for prevalence studies [16], the initial theoretical sample size was estimated to be 245.

$n=Z^2p(1-p)/d^2= (1.96)^2\times0.5\times0.5/ (0.0625)^2\approx 245$

To account for an approximate 10% potential non-responses, this figure was adjusted upward, resulting in a final sample size of 269.

Data collection

The data collection instrument used in the present study was a valid and reliable questionnaire adopted from a similar study which was registered as an undergraduate thesis at School of Dentistry, Tehran University of Medical Sciences. [17], and subsequently published [11]. The questionnaire's face validity was established through evaluation by three experts holding PhDs in community oral health. Its reliability was confirmed by a pilot study involving 12 private-practice dentists, which calculated a Cronbach's alpha of 0.75, a value considered acceptable [11].

The questionnaire collected the following demographic and professional information: age by year (later categorized as <30, 31-40, 41-50, and >50), gender, dental specialty (general and specialist), and working sectors (public, private, both sectors). Additionally, the questionnaire requested the participants' knowledge, attitudes, practices, and barriers related to the prescription of fluoride products through queries, such as the availability of specific guidelines for prescribing fluoride products in the workplace, dentists' self-reported practices regarding fluoride application over the past six months, their perceptions of barriers to fluoride use, and their level of agreement with statements regarding the effectiveness of fluoride in caries prevention.

The last question inquired dentists' approaches to applying preventive measures, differentiating between a child high-risk (CHR) and an adult high-risk (AHR) case. The description for the CHR case was as follows: A 5-year-old child has been referred for treatment due to multiple dental caries. His mother reports that he brushes his teeth with children's toothpaste once every two days. Considering that the child's drinking water is fluoride-free, which treatment methods would you recommend? The description for the AHR case was as follows: A 25-year-old woman presents with multiple enamel caries in the interproximal areas of her posterior teeth, despite brushing twice daily with adult toothpaste. Given that the drinking water in her area during childhood contained less than 0.3 ppm fluoride, which treatment methods would you recommend for her? For both cases, the respondents could select one or more from the following treatment options: restorative treatment, fluoride varnish application, fluoride mouthwash prescription, fluoride tablet or drop prescription, fluoride gel application, and no treatment.

Data analysis

Descriptive statistics were used to summarize the demographic and practice-related characteristics of the respondents by percentages and frequencies of the participants' answers to different items. The chi-square test

was employed to evaluate the statistical significance of differences in responses based on gender, age groups, dental specialty, and working sector. Statistical significance was set at $p<0.05$. The data were analyzed using statistical package for social sciences software (SPSS version 21.0).

Ethical considerations

The participants were informed about the study's anonymity, voluntary nature, objectives, process, and the confidentiality of their responses. Completing the questionnaire was regarded as implied informed consent to participate in the research. As obtaining ethical approval from an official ethics committee was not mandatory at the time this study was implemented, the ethical concerns were reviewed and approved by the Department of Community Oral Health at School of Dentistry, Shahid Beheshti University of Medical Sciences.

Results

The demographic and practice-related characteristics of the dentists are presented in Table 1. Of total respondents, 55% were male, 58% were over 30 years old, 84% were identified as general dentists, and 63% reported to work exclusively in private practice.

Table 1- Distribution of the dentists (N=269)[1] based on their personal and practice-related factors.

		N	%
Gender	Men	147	55
	Women	119	45
Age groups (years)	<30	105	42
	31-40	74	29
	41-50	48	19
	>50	25	10
Dental specialty	General dentist	223	84
	Specialist	43	16
Working sector	Only public	38	18
	Only private	132	63
	Both sectors	41	19

1. From 3 to 58 missing data due to no answer for various factors.

Table 2 presents dentists' responses concerning the availability of specific guidelines for prescribing fluoride products in their workplaces, as well as their past participation in courses related to fluoride prescription. Overall, 40% of the dentists reported having specific guidelines for fluoride prescription. This finding was more prevalent among women than men (44% vs. 34%, $p=0.12$), younger than older (48% vs. 39%, $p<0.001$), and dentists working in both public and private sectors (51%) compared to those working exclusively in the private sectors (30%) ($p=0.01$). Moreover, dentists younger than 30 years old, more frequently reported participation in a workshop or continuing education course on the principles of prescribing fluoride products in the past six months.

Figure 1 illustrates the distribution of dentists' level of agreement with statements regarding the effectiveness of fluoride in caries prevention. Most dentists (73-97%) agreed with eight out of the eleven knowledge items. However, the percentage of respondents was significantly lower for three specific items. Slightly more than 50% of dentists agreed on the effectiveness of fluoride in reducing caries in individuals over 12 years old. Additionally, less than 40% indicated that they would avoid prescribing fluoride due to its potential toxic effects, and a similar percentage cited a lack of sufficient time as a barrier to providing hygiene education and using fluoride in clinical practice.

Figure 2 shows the distribution of dentists' self-reported practices regarding fluoride application over the past six months. About 10% of dentists reported prescribing fluoride products for home use and in-office fluoride therapy for individuals over 12 years old. This percentage, increased to approximately 30% for children under 6 years old, and for those aged 6 to 12, about 35% of dentists reported using fluoride products. Additionally, about one-third of dentists indicated that they use fluoride products for themselves and their families.

Figure 3 illustrates dentists' perceptions of various barriers to the use of fluoride products. In response to the question, "What do you think prevents dentists from prescribing fluoride products to their patients?" the dentists identified the following barriers: low treatment tariffs (45%), skepticism about fluoride's effectiveness (42%), time-consuming treatments (25%), and high costs of fluoride products (13%). Additionally, when asked, "What do you think prevents patients from using fluoride products?" the dentists reported: lack of access to service centers and skepticism about fluoride's effectiveness (27%), high costs of fluoride products (26%), and insufficient time for treatments (14%).

Figure 4 compares dentists' agreement on applying preventive measures for the CHR versus AHR cases. Most dentists indicated they would treat both cases restoratively. Over 80% agreed to apply fluoride varnish and gel for the CHR case, but this percentage was lower for the AHR case. The least common responses pertained to prescribing fluoride tablets and drop or no treatment for both cases. For both patient types, agreement was highest for restorative treatment.

Table 2- Distribution of the dentists' (N=269)[1] answers regarding two questions about fluoride prescription based on their personal and practice-related factors.

		Is there a specific guideline for prescribing fluoride products available in your workplace?	Have you participated in a workshop or continuing education course on the principles of prescribing fluoride products in the past 6 months?
		N (%)	N (%)
All		104 (40)	44 (17)
Gender	Men	63 (44)	29 (20)
	Women	39 (34)	13 (11)
	p-value[2]	0.12	0.06
Age groups (years)	<30	50 (48)	26 (25)
	31-40	27 (39)	5 (7)
	41-50	17 (35)	9 (19)
	>50	0 (0)	0 (0)
	p-value[2]	<0.001	0.002
Dental specialty	General dentist	86 (39)	38 (17)
	Specialist	16 (40)	4 (10)
	p-value[2]	1.00	0.35
Working sector	Only public	19 (50)	10 (26)
	Only private	39 (30)	14 (11)
	Both sectors	21 (51)	6 (15)
	p-value[2]	0.01	0.06

1. From 3 to 58 missing data due to no answer for various factors.
2. Statistical evaluation: The chi-square test.

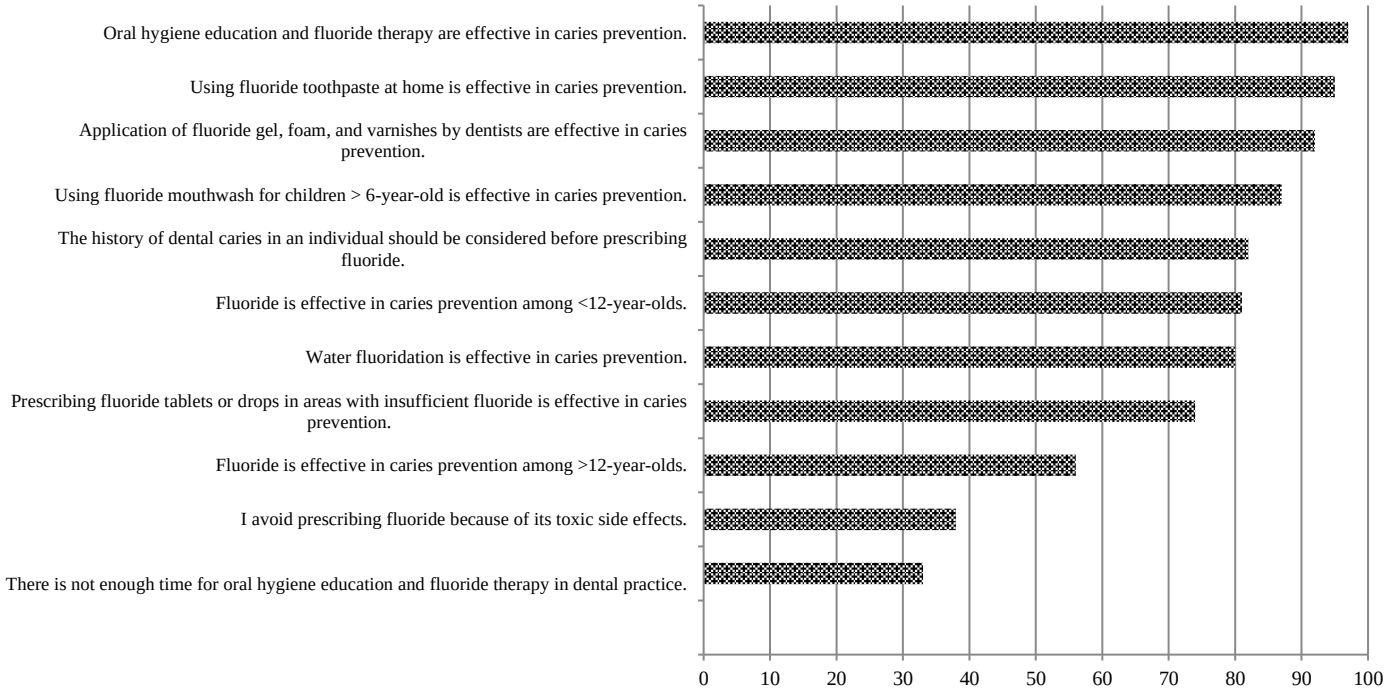

Figure 1: Distributions (%) of dentists' level of agreement with statements regarding fluoride effectiveness in caries prevention.

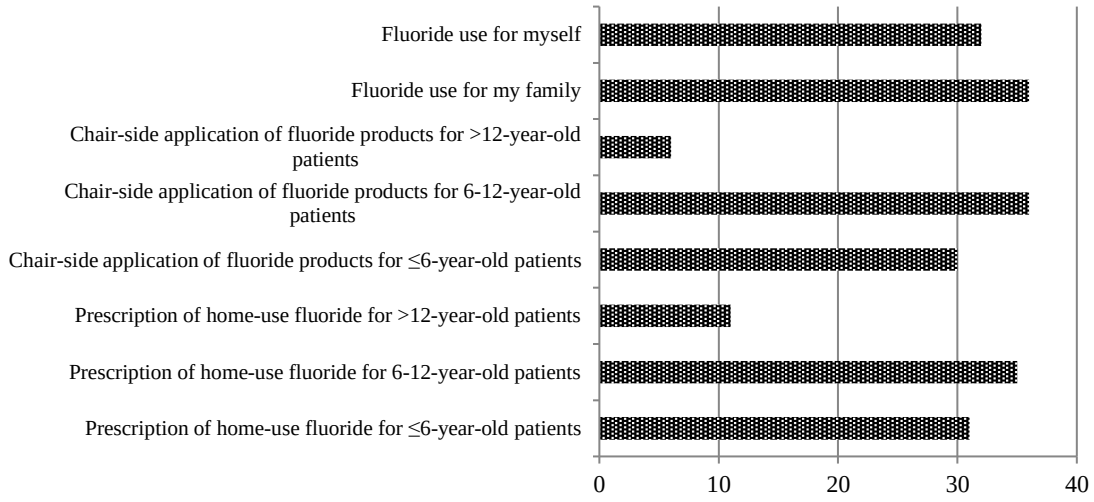

Figure 2: Distributions (%) of dentists' self-reported practice regarding fluoride application during the past six months for different types of patients.

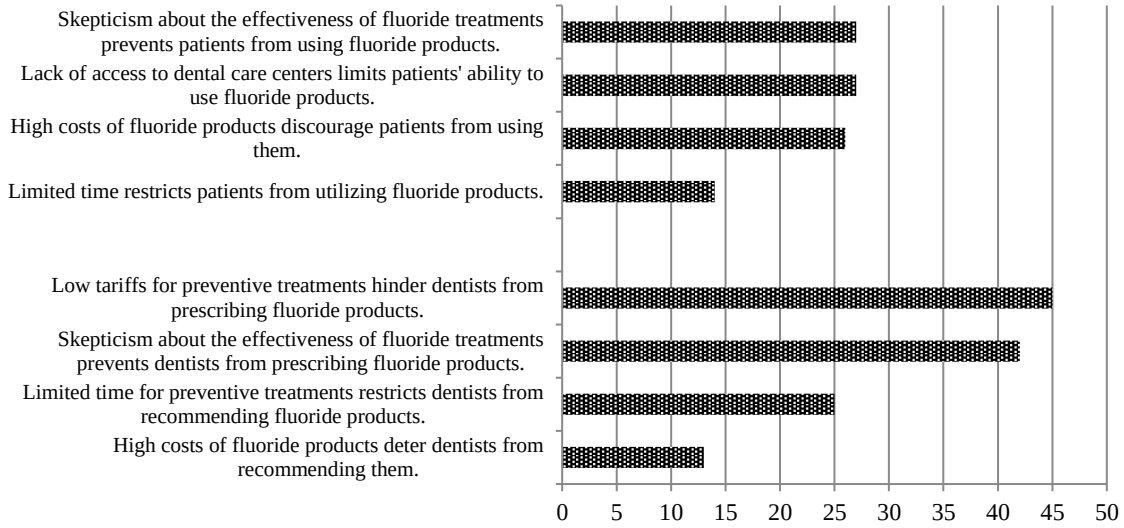

Figure 3: Distribution (%) of dentists' perceptions of various barriers to the use of fluoride products, from both their own perspective and that of their patients.

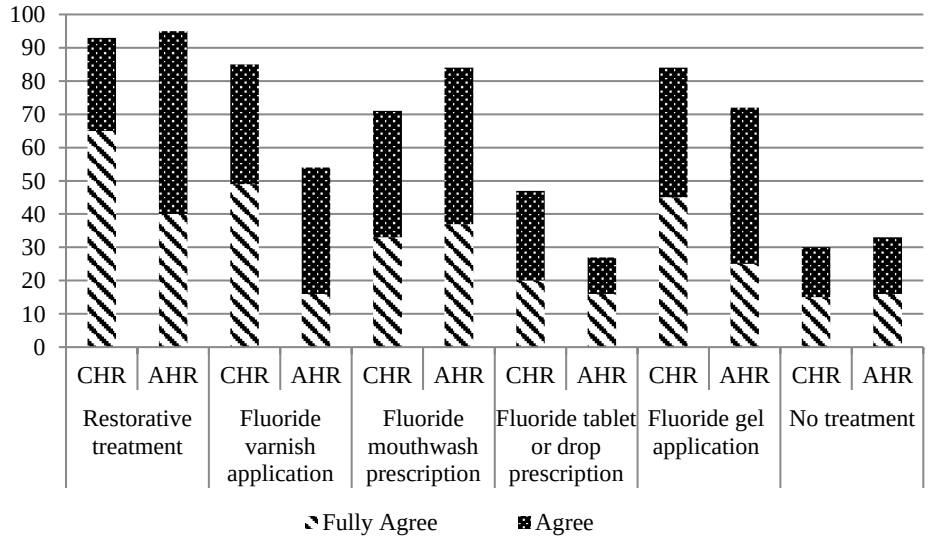

Figure 4: Distributions (%) of dentists' level of agreement with applying various treatment options, separately for a child high-risk (CHR) case and an adult high-risk (AHR) case.

Discussion

This study aimed to assess the knowledge, attitudes, and practices of Iranian dentists regarding fluoride product prescription and to identify the associated barriers to its effective clinical use. The studied dentists rarely reported access to fluoride prescription guidelines and participation in related courses. Although most dentists acknowledged the general effectiveness of fluoride in preventing caries, fewer recognized its benefits for individuals over the age of 12. The application of fluoride by dentists was significantly more prevalent for children under the age of 12 compared to adults. Many dentists identified low reimbursement rates, skepticism about fluoride's effectiveness, and time constraints as major barriers to its use. Additionally, most dentists favored restorative treatments for high-risk cases.

The availability of clinical guidelines for fluoride use is a potential facilitator for its application in dental practice. Clinical practice guidelines are recommendations aimed at optimizing patient care, based on a systematic review of evidence. These guidelines should help standardize treatment practices and improve the quality of dental care. In this study, less than half of the dentists reported having access to such a guideline in their workplace. This figure, while modest, is notably higher than the approximate one-third of dentists who reported guideline availability in a previous study conducted in Tehran [11]. This difference may be attributed to variations in sampling, the time elapsed between the studies allowing for increased dissemination of guidelines, or regional differences in clinical policy implementation within Iran. Despite this improvement, the overall rate remains suboptimal, indicating a persistent gap between the development of evidence-based guidelines and their integration into clinical settings. This challenge is not unique to Iran; for example, a study from Japan also found that only a minority of dentists routinely use practice guidelines [18], underscoring a global difficulty in translating guidelines into consistent clinical behavior.

Participating in continuing education is a crucial mechanism for dentists to maintain and enhance their clinical knowledge, including on topics like fluoride application. In this study, only a small minority of dentists (roughly one-sixth) reported receiving recent training on fluoride products. This rate, while low, is substantially higher than the finding from an earlier study in Tehran, which reported that only a very small fraction of dentists had undertaken such training [11]. This notable difference may reflect a positive temporal trend towards greater engagement with continuing education in Iran or variations in the professional networks sampled in each study. The low uptake of training is not unique to this context; for instance, a study from Italy [19] also found that a small minority of dentists had received continuing education on a specific fluoride treatment, suggesting a broader, international challenge in disseminating new preventive care information through these channels. Conversely, a research from Isfahan [20] indicated a strong interest among dentists in receiving such training. This juxtaposition of low current participation with high expressed interest reveals a significant opportunity; it suggests that the demand for knowledge exists and that enhancing dentists' competency in fluoride use could be achievable with more accessible, effective, and consistently offered training programs.

While this study found that approximately two-thirds of dentists demonstrated correct knowledge on most fluoride-related statements, a significant knowledge gap was identified concerning its efficacy in adults. Only just over half of the respondents agreed with the statement on fluoride's effectiveness for individuals over 12 years old. This misconception, which parallels findings among dentists in Kuwait [14], may stem from a historical emphasis in dental education and public health campaigns on fluoride's role in pediatric caries prevention, potentially at the expense of highlighting the robust evidence supporting its benefits across all age groups [21]. This interpretation suggests that the underlying issue is not a lack of information but rather a specific, persistent gap concerning adult care. Therefore, these results highlight a critical need for targeted continuing education programs that specifically address and reaffirm the continued importance of fluoride in managing caries risk in adult population.

The self-reported practice of fluoride prescription was limited among the surveyed dentists. In the current study, only about one-third of participants reported prescribing fluoride products in the last six months, a rate that decreased to a small minority for patients older than 12. This finding aligns with the broader theme of underutilization, further underscored by the fact that only about one-third of dentists reported using fluoride products for their own family members. This latter figure is considerably lower than the vast majority reported in a previous study from Tehran [11]. The stark contrast in self-use between the two studies may be attributable to key differences, such as the sampling of dentists from a national congress in the present study versus a specific city in the earlier research, or perhaps evolving perceptions over time regarding the necessity of fluoride for adult oral health. This consistently low level of application, both professionally and personally, strongly indicates that the barriers to fluoride use are deeply embedded and extend beyond mere clinical settings, reflecting broader issues of knowledge translation, belief in efficacy, and perhaps systemic disincentives [22, 23].

Dentists in the present study identified several barriers to the use of fluoride products in their clinics. The most frequently cited barriers were systemic and provider-related; nearly half of the respondents pointed to low reimbursement rates for preventive treatments and a personal skepticism regarding the efficacy of fluoride in caries control. Furthermore, approximately one-quarter of dentists attributed barriers to patient-related factors, such as a perceived patient skepticism about fluoride's benefits, limited access to care, or the

treatment cost. These findings are consistent with those from prior research in Iran and the United Kingdom [22, 24], which similarly identified economic disincentives, provider beliefs, and patient perceptions as primary obstacles. The convergence of these barriers across diverse geographic and healthcare contexts underscores that they are not isolated issues but rather fundamental challenges that impede the adoption of preventive care universally. This consistent pattern emphasizes the critical need for a multi-faceted strategy that addresses financial structures, enhances education for both providers and patients, and improves the accessibility of preventive services to effectively integrate fluoride into routine practice.

The dentists in the present study considered risk-based approach, with varying levels of agreement for applying treatment options between child and adult high-risk cases, reflecting an awareness of age-specific preventive needs. They showed stronger consensus for interventions like fluoride application and oral hygiene instruction in the CHR case, likely driven by their perception regarding higher caries susceptibility in children. In contrast, agreement was lower for the AHR case, suggesting a perception of reduced urgency or differing treatment priorities for adults, possibly influenced by lifestyle factors or access to care. This pattern partially mirrors earlier findings [13], where risk differentiation was evident but inconsistent, indicating a need for targeted education on age-tailored prevention. Integrating these insights into dental curricula and continuing education in Iran could enhance precision in managing high-risk patients across age groups, optimizing both clinical outcomes and resource use in dental public health. Interestingly about one-third of respondents chose "no treatment" for both cases. This could stem from a sense of disappointment among dentists regarding their ability to manage dental caries in high-risk patients. They may assume that treatment is likely to fail soon, leading to patient dissatisfaction. Consequently, dentists probably decided against treatment, believing that caries in these patients is not preventable. This perception aligns with findings from a study from Kuwait [14] which found that fewer than ten percent of dentists believed that caries is unpreventable.

This study had several limitations that should be considered when interpreting its findings. The sample size calculation assumed simple random sampling, but a convenience sample was used due to logistical constraints at the Iranian General Dentists Congress. This may introduce selection bias and limit generalizability, as participants attending the congress may differ from the broader population of Iranian dentists in terms of interest in professional development and access to resources. Furthermore, the reliance on self-reported data for assessing knowledge, attitudes, and practices is subject to potential recall and social desirability biases. The cross-sectional nature of the study design also precludes the establishment of causal relationships between the identified variables.

Conclusion

This study revealed that while Iranian dentists generally acknowledged the effectiveness of fluoride, their knowledge was particularly limited regarding its benefits for adults, and its clinical application remained infrequent, especially for patients over 12 years of age. The main barriers to its use were identified as low reimbursement rates, skepticism about efficacy, and time constraints. These findings highlight a critical gap between theoretical knowledge and clinical practice in caries prevention.

The profession shows a willingness to prioritize evidence-based prevention for high-risk groups like children, indicating a solid foundation for progress. However, the inconsistent application across all patient ages reveals a significant opportunity to better align practice with global standards. The barriers identified—both systemic and attitudinal—call for a fundamental rethinking of how education and support are delivered to practitioners. Ultimately, addressing these challenges through enhanced training, standardized guidelines, and policy interventions is essential to empower the dental workforce to fully embrace its role in comprehensive disease prevention and improve oral health outcomes in Iran.

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Author Contributions: H.G.: Conceptualization, Methodology, Investigation, Writing – Original and Review drafts, Supervision; and M.N.: Methodology, Project implementation, Data Curation.

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Ethical Approval Code: At the time of performing this study, having an ethical approval code was not mandatory. However, participants were informed that participation in the study was entirely voluntary. They were given details about the study's objectives, and questionnaires were distributed only to those who provided their consent. Participants were also assured that their responses would be kept confidential. The study received approval from the Department of Community Oral Health at Shahid Beheshti School of Dentistry.

Informed Consent Statement: Questionnaires were distributed only to those who provided their informed consent.

Data Availability Statement: The datasets generated during the current study are available from the corresponding author upon reasonable request.

Using AI: This manuscript has exclusively utilized Deepseek (version 3) for language enhancement. The tool was employed to improve the clarity, coherence, and grammatical accuracy of the text, while preserving the original meaning and scholarly integrity of the content. No aspect of the research design, data analysis, interpretation of results, or conceptual contributions was generated or influenced by AI. The authors retain full responsibility for the intellectual content of this work.

Conflict of Interest: No conflicts of interest to declare.

References

1.Almasvandi Y, Ziaei N, Kazeminia M, Abbasi P. Global prevalence of dental caries in the older people, 1991 to 2024: a systematic review and meta-analysis. Saudi Dent J. 2025;37(7-9):31. doi: 10.1007/s44445-025-00039-6

2.Toumba K, Twetman S, Splieth C, Parnell C, Van Loveren C, Lygidakis N. Guidelines on the use of fluoride for caries prevention in children: an updated EAPD policy document. Eur Arch Paediatr Dent . 2019;20(6):507-516. doi: 10.1007/s40368-019-00464-2.

3.Clark MB, Keels MA, Slayton RL, Braun PA, Fisher-Owens SA, Huff QA. Fluoride use in caries prevention in the primary care setting. Pediatrics. 2020;146(6). doi:10.1542/peds.2020-034637

4.Dhyppolito IM, Nadanovsky P, Cruz LR, de Oliveira BH, Dos Santos APP. Economic evaluation of fluoride varnish application in preschoolers: A systematic review. Int J Paediatr Dent. 2023;33(5):431-49. doi:10.1111/ipd.13049

5.Davoodi-Lahijan J, Farrokh-Eslamlou HR, Shariat-Torbaghan K, Nouraei-Motlagh S, Alinia C, Yusefzadeh H. Economic evaluation of fluoride varnish application in Iranian schools. J Oral Health Oral Epidemiol. 2021;10(2):64-71. doi:10.22122/johoe.v10i2.1146

6.Tandon MC, Warren JJ, Daly JM. Prevalence and associated factors of fluoride varnish application. J Am Board Fam Med.. 2024;37(5):826-32. doi:10.3122/jabfm.2024.240066R1

7.Ko A, Banks JT, Hill CM, Chi DL. Fluoride prescribing behaviors for medicaid-enrolled children in Oregon. Am J Prev Med. 2022;62(2):e69-e76. doi:10.1016/j.amepre.2021.06.016

8.Weyant RJ, Tracy SL, Anselmo TT, Beltrán-Aguilar ED, Donly KJ, Frese WA, et al. Topical fluoride for caries prevention. J Am Dent Assoc. 2013;144(11):1279-91. doi: 10.14219/jada.archive.2013.0057

9.Bramhecha A, Datta J, Balasubramaniam A. What preventive strategies do dentists prescribe for dental caries prevention?–A KAP survey. Dent Res J (Isfahan). 2023;20(1):51.

10. Nilchian F, Ataie Z, Azadi S. Isfahan general dentist's awareness, attitude, and performance regarding prescription of new caries prevention materials containing calcium and fluoride components. J Educ Health Promot. 2023;12(1):74. doi:10.4103/jehp.jehp_212_20

11. Pakdaman A, Yarahmadi Z, Kharazifard MJ. Self-reported knowledge and attitude of dentists towards prescription of fluoride.J Dent (Tehran). 2015;12(8):550-6.

12. Khami MR, Haghparast Ghomsheh A, Hessari H, Shati M. Knowledge of the health personnel involved in the fluoride varnish therapy programs of primary schools in Tehran, Iran. BMC Oral Health. 2024;24(1):649. doi:10.1186/s12903-024-04390-8

13. Ghasemi H, Murtomaa H, Torabzadeh H, Vehkalahti MM. Risk-based approach in preventive practice among Iranian dentists.Oral Health Prev Dent. 2008;6(1):53-60.

14. Akbar AA, Al-Sumait N, Al-Yahya H, Sabti MY, Qudeimat MA. Knowledge, attitude, and barriers to fluoride application as a preventive measure among oral health care providers. Int J Dent. 2018:2018:8908924. doi: 10.1155/2018/8908924

15. Ross A, Sherriff A, Kidd J, Gnich W, Anderson J, Deas L, et al. A systems approach using the functional resonance analysis method to support fluoride varnish application for children attending general dental practice.Appl Ergon. 2018;68:294-303. doi:10.1016/j.apergo.2017.12.005

16. Lesaffre E, Feine J, Leroux B, Declerck D. Statistical and methodological aspects of oral health research: Wiley Online Library; 2009. chap 16, p: 282. doi:10.1002/9780470744116

17. Yarahmadi Z. Assessment of dentists' knowledge, attitude, and practice regarding prescribing fluoride-containing products. Tehran, Iran: Tehran University of Medical Sciences; 2010. No. 4846. [Undergraduate thesis in Persian]. https://lib.tums.ac.ir/faces/search/bibliographic/biblioFullView.jspx?_afPfm=dr9h85aum

18. Kakudate N, Yokoyama Y, Sumida F, Matsumoto Y, Gordan VV, Gilbert GH. Use of clinical practice guidelines by dentists: findings from the Japanese dental practice-based research network. J Eval Clin Pract. 2017;23(1):96-101. doi:10.1111/jep.12611

19. Salerno C, Conti G, Cirio S, Maspero C, Senna A, Campus G, et al. Training received, knowledge, and use of Silver Diamine Fluoride among Italian dentists: a nationwide survey. BMC Oral Health. 2025;25(1):106. doi:10.1186/s12903-024-05181-x

20. Zamanifar A, Asgari I. Continuing professional development programs for general dentists in Isfahan province, Iran: Interests, priorities, and obstacles. Dent Res J (Isfahan). 2022;19(1):69.

21. Jurasic M, Gibson G, Orner M, Wehler C, Jones J, Cabral H. Topical fluoride effectiveness in high caries risk adults. J Dent Res. 2022;101(8):898-904. doi:10.1177/00220345221081524

22. Ghasemi H, Murtomaa H, Torabzadeh H, Vehkalahti MM. Perceived barriers to the provision of preventive care among Iranian dentists.Oral Health Prev Dent. 2009;7(4):339.

23. Lienhart G, Elsa M, Farge P, Schott A-M, Thivichon-Prince B, Chanelière M. Factors perceived by health professionals to be barriers or facilitators to caries prevention in children: a systematic review. BMC Oral Health. 2023;23(1):767. doi: 10.1186/s12903-023-03458-1

24. Leggett H, Vinall-Collier K, Csikar J, Owen J, Edwebi S, Douglas G. A scoping review of dental practitioners' perspectives on perceived barriers and facilitators to preventive oral health care in general dental practice. BMC Oral Health. 2024;24(1):249. doi:10.1186/s12903-024-04022-1