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Knowledge, Attitude, and Self-Reported Practice Regarding Fissure Sealants among Senior Dental Students in Tehran University of Medical Sciences

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ABSTRACT

Introduction: Dental caries is a prevalent oral disease, and fissure sealants are effective preventive measures. Dental students play a crucial role in influencing public acceptance of this treatment. This study aimed to assess the knowledge, attitude, and self-reported practice regarding fissure sealants among senior dental students at Tehran University of Medical Sciences (TUMS).

Materials and Methods: This cross-sectional study was conducted in 2023. A census sampling method was employed to recruit all eligible senior dental students (N = 163). The participants included fifth- and sixth-year dental students from both campuses of the School of Dentistry, TUMS. Data were collected using a validated, anonymous questionnaire comprising four sections: demographics, knowledge (11 questions), attitude (8 questions), and self-reported practice (14 questions). Statistical analysis was performed using SPSS version 26 via the Mann-Whitney test, Spearman's correlation, and multiple linear regression analysis.

Results: Out of 163 distributed questionnaires, 117 were completed (response rate: 72%). The participants included 61 (52.1%) males and 56 (47.9%) females. The mean scores were 8.4±1.7 (out of 11) for knowledge, 28.8±3.5 (out of 40) for attitude, and 9.9±1.7 (out of 14) for self-reported practice. Male students showed significantly higher knowledge scores compared to females (P = 0.02). Fifth-year students also scored significantly higher in knowledge than sixth-year students (P = 0.04). A significant positive correlation was found between self-reported practice and both knowledge (P = 0.02) and attitude (P = 0.003).

Conclusion: Senior dental students demonstrated an acceptable level of theoretical knowledge regarding fissure sealants. However, their attitude and self-reported practice fell short of expected standards, highlighting the need for educational reinforcement and practical training in the dental curriculum.

Keywords: Knowledge; Attitude; Dental caries; Pit and fissure sealants; Dental students.

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Introduction

Despite significant advancements in preventive dentistry, dental caries persists as the most common non-communicable disease globally, placing a substantial strain on public health systems [1]. The World Health Organization's 2022 Global Oral Health Status Report underscores this crisis, revealing that oral conditions affect approximately 3.5 billion individuals, with untreated decay in permanent teeth identified as the most frequent health condition worldwide [1]. In Iran, recent meta-analyses indicate a high prevalence of dental caries among school-aged children, highlighting an urgent need for effective preventive strategies [2]. While caries can affect any tooth surface, the occlusal surfaces of permanent posterior teeth are disproportionately vulnerable. Although these surfaces account for only about 12% of the total tooth surface area, they are responsible for approximately 90% of carious lesions in permanent teeth. This susceptibility is attributed to the complex morphology of pits and fissures, which act as retentive niches for biofilm accumulation and are often inaccessible to mechanical cleaning by toothbrush bristles [3].

To protect these vulnerable surfaces, pit and fissure sealants are a proven solution. They act as a physical shield, covering deep grooves, preventing the entrapment of bacteria and food particles [4]. The evidence for sealants is Substantial; a Cochrane review (2017) showed that resin-based sealants can reduce decay in permanent molars by nearly 80% in the first 2 years [5]. Based on these data, the American Dental Association (ADA) and the American Academy of Pediatric Dentistry (AAPD) strongly recommend sealants for at-risk teeth [3]. The effectiveness of sealants is substantiated by extensive data, including a 2023 umbrella review that validates them as a reliable preventive method; however, their clinical application remains suboptimal [6]. This gap between evidence and practice is clearly visible in Iran. Research indicates that most general dental practitioners do not provide preventive services. For instance, a study in southeast Iran reported that fewer than half of dentists regularly placed fissure sealants in children who needed them, often due to a lack of emphasis on prevention in their daily practice [7]. The root of this underutilization often lies in the disconnection between theoretical knowledge and clinical practice. While Iranian dentists and specialists may possess acceptable knowledge and positive attitudes, this does not always translate into action. Horri et al. found that although practitioners had good attitudes toward preventive methods, their actual practice scores were only moderate [8]. More recently, a 2023 study on dentists in Isfahan confirmed that while attitudes were positive, specific training programs are still needed to stimulate the actual prescription of preventive materials [9]. Dental students represent the future of this landscape. If preventive habits are not solidified during university years, they are unlikely to develop later. In a foundational study, Khami et al. highlighted that while Iranian senior dental students had positive attitudes, they lacked sufficient practical engagement in self-care and preventive dentistry [10]. Recent evaluations of the Iranian dental curriculum show that while fissure sealants are taught didactically and clinically, there is still a notable variation in how minimally invasive interventions are emphasized compared to restorative treatments [11]. This is particularly critical because, as a recent concise by Ng et al. highlights, the field of dental sealants is constantly evolving with new materials and application techniques, requiring continuous updates in education [12]. Considering these educational gaps and the need for updated data, this study aimed to evaluate the knowledge, attitude, and self-reported practice regarding fissure sealants among senior dental students at Tehran University of Medical Sciences (TUMS).

Materials and Methods

Study Design and Population

This cross-sectional descriptive-analytical study was conducted during the academic year 2023 at the School of Dentistry, Tehran University of Medical Sciences (TUMS), a leading dental school in the country. The study population consisted of all senior dental students (fifth- and sixth-year) enrolled at both university campuses. A census sampling method was employed to include all eligible students (N = 163). The inclusion criteria were being a senior dental student enrolled in the 2023 academic year. Students who were unwilling to participate or returned incomplete questionnaires were excluded from the study.

Data Collection Instrument

Data were collected using a structured, anonymous, self-administered questionnaire. The instrument was developed based on similar previous studies [13,14] and consisted of four sections:

- **Demographic Information:** Age, gender, and academic year.

- **Knowledge:** Comprising 11 questions regarding the indications, techniques, and properties of fissure seal-

ants. Responses were scored as 1 for a correct answer and 0 for an incorrect or "don't know" answer (range: 0-11).

- **Attitude:** Consisting of 8 items scored on a 5-point Likert scale (from "Strongly Disagree", scored as 1, to "Strongly Agree", scored as 5) (range: 8-40).

- **Self-Reported Practice:** Including 14 questions concerning the clinical application of sealants, scored as 1 (correct practice) or 0 (incorrect practice) (range: 0-14).

To ensure the instrument's accuracy, both face and content validity were assessed. A pilot group of dental students evaluated the face validity of the questions to determine their clarity and simplicity. The content validity was assessed by a panel of five experts, including specialists in Community Oral Health, Pediatric Dentistry, and Epidemiology. The Content Validity Index (CVI) and Content Validity Ratio (CVR) were calculated as 0.91 and 0.85, respectively. Reliability was confirmed via a pilot study on 20 students (excluded from the main study), yielding a Cronbach's alpha coefficient > 0.7.

Ethical Considerations

The study protocol was approved by the Ethics Committee of the School of Dentistry, Tehran University of Medical Sciences (Ethical Code: IR.TUMS.DENTISTRY.REC.1402.100). The objectives of the study were explained to the students, and participation was voluntary. Questionnaires were distributed at the end of theory classes and collected immediately upon completion.

Statistical Analysis

Data were analyzed using SPSS software version 26 (IBM Corp., Armonk, NY, USA). The normality of quantitative variables was assessed using the Shapiro-Wilk test. Since the data did not follow a normal distribution, non-parametric tests were employed. Descriptive statistics were reported as frequencies (percentages) for qualitative variables and as Mean ± Standard Deviation (SD) for quantitative variables. The Mann-Whitney U test was used to compare mean scores between groups (gender and academic year). Linear multivariate analysis was performed to evaluate the association between background variables and KAP scores. A P-value of less than 0.05 was considered statistically significant.

Results

A total of 163 questionnaires were distributed, of which 117 were fully completed and returned, yielding a response rate of 72%. The mean age of the participants was 24.37 ± 2.20 years (range: 22–34 years). The study population consisted of 61 (52.1%) male and 56 (47.9%) female students. Regarding the academic year, 52 (44.4%) were in the fifth year, and 65 (55.6%) were in the sixth (final) year of dentistry (Table 1).

Knowledge, Attitude, and Practice Scores

The detailed distribution of responses regarding knowledge, attitude, and self-reported practice is presented in Tables 2, 3, and 4, respectively. Regarding knowledge, the highest correct response rate was observed for instructions on sealant placement (99.1%). In comparison, the lowest was related to the awareness that sealants can wear out easily (41.9%) (Table 2). In terms of attitude, the most positive response was the need to promote sealants among dentists (88.0% agreement). However, 32.5% of students believed that performing the technique correctly is time-consuming (Table 3). For self-reported practice, proper isolation and cleaning of the tooth surface were the most frequently performed steps (94.0%). In contrast, the routine use of a rubber dam was the least reported practice (13.7%) (Table 4). The overall mean scores for knowledge, attitude, and self-reported practice were 8.46 ± 1.68 (out of 11), 28.85 ± 3.52 (out of 40), and 9.97 ± 1.74 (out of 14), respectively, as summarized in Table 5.

Analytical findings

Table 6 presents a comparison of KAP scores by gender and academic year. The Mann-Whitney U test revealed that male students had significantly higher knowledge scores compared to female students (P = 0.02). However, no significant difference was observed between genders regarding attitude and practice scores (P > 0.05). Regarding the academic year, fifth-year students scored significantly higher in the knowledge domain compared to sixth-year students (8.71 vs. 8.26, P = 0.04). There were no statistically significant differences in attitude and practice scores between the two academic years. Spearman's correlation analysis showed significant positive correlations between self-reported practice and knowledge (r = 0.21, P = 0.02) and between self-reported practice and attitude (r = 0.26, P = 0.003). This indicates that students with higher knowledge and more positive attitudes reported better clinical performance. Additionally, a significant negative correlation was found between age and knowledge scores (r =

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-0.21, P = 0.02), suggesting that older students tended to have lower theoretical knowledge scores.

Table 1. Demographic characteristics of the participants (N = 117).

Variable	*Category*	*Frequency (n)*	*Percentage (%)*
Gender	*Male*	*61*	*52.1*
	Famale	*56*	*47.9*
Academic Year	*Fifth Year*	*52*	*44.4*
	Sixth Year	*65*	*55.6*

Table 2. Distribution of correct responses regarding knowledge items.

Knowledge Questions	*Correct Answer*	n	٪
1. The effectiveness of Fissure sealants is confirmed by substantial evidence.	*Yes*	*106*	*90.6*
2. I am familiar with the sealant application technique.	*Yes*	*114*	*97.4*
3. I know the instructions for sealant placement.	*Yes*	*116*	*99.1*
4. Sealants should only be used on newly erupted teeth.	*Yes*	*90*	*76.9*
5. Sealants wear out easily.	*Yes*	*49*	*4109*
6. Pit and fissure sealants have adverse effects.	*No*	*99*	*84.6*
7. Technique is the most critical aspect of success.	*Yes*	*90*	*76.9*
8. Resin-based sealants are more effective than Glass Ionomer.	*Yes*	*54*	*46.2*
9. Acid etching is recommended for higher retention.	*Yes*	*84*	*71.8*
10. Sealants can be both preventive and therapeutic.	*Yes*	*78*	*66.7*
11. Sealants combined with fluoride can significantly reduce caries.	*Yes*	*106*	*90.6*

Table 3. Distribution of responses regarding Attitude items.

Attitude Items	*Agree*		*Neutral*		*Disagree*	
	n	*%*	*n*	*%*	*n*	*%*
1. Correct performance of this technique is time-consuming.	*35*	*32.5*	*15*	*12.8*	*64**	*54.7*
2. Materials used for sealants are costly.	*11*	*9.4*	*40*	*34.2*	*66**	*56.4*
3. Sealants should not be used routinely due to short longevity.	*6*	*5.1*	*10*	*8.5*	*101**	*86.4*
4. Fissure sealants are underutilized.	*70**	*59.8*	*38*	*32.5*	*9*	*7.7*
5. Explaining what sealants are to patients is difficult.	*25*	*21.3*	*18*	*15.4*	*74**	*63.2*
6. Justifying the cost of sealants to parents is difficult.	*26*	*22.2*	*22*	*18.8*	*53**	*45.3*
7. Patients understand the benefits of sealants.	*75**	*64.1*	*9*	*7.7*	*10*	*8.5*
8. Promoting sealants among dentists/faculty is necessary.	*103**	*88.0*	*10*	*8.5*	*4*	*3.4*

(Agree includes “strongly agree” and “agree”; disagree includes “strongly disagree” and “disagree”).

Table 4. Distribution of responses regarding self-reported practice.

Self-Reported Practice Items	*Correct Answer*	n	٪
1. I sometimes avoid sealants due to the risk of sealing over caries.	*Yes*	*74*	*63.2*
2. I recommend re-sealing if the sealant is partially or totally lost.	*Yes*	*82*	*70.1*
3. Isolation is the most critical factor for retention.	*Yes*	*11*	*94.0*
4. Proper etching is the most critical factor for retention.	*Yes*	*28*	*23.9*
5. Sealant use should be based on caries risk assessment.	*Yes*	*103*	*88.0*
6. I clean the tooth surface before placing the sealant.	*Yes*	*110*	*94.0*
7. I follow the manufacturer’s instructions for light curing.	*Yes*	*95*	*81.2*

Self-Reported Practice Items	Correct Answer	n	%
8. I use bonding agent on the etched surface.	Yes	84	71.8
9. I use a rubber dam during sealant placement.	Yes	16	13.7
10. I use cotton rolls for isolation.	Yes	102	87.2
11. I use more material to ensure retention.	No	97	82.9
12. I remove excess material to ensure proper occlusion.	Yes	102	87.2
13. I repeat the procedure if a technical error occurs.	Yes	99	84.6
14. I use fluoride-free prophylaxis paste before placement.	Yes	66	56.4

Table 5. Mean scores of Knowledge, Attitude, and Practice (N = 117).

Domain Scores	Mean ± SD	Range	Maximum Possible
Knowledge	8.46 ± 1.68	3 – 11	11
Attitude	28.85 ± 3.52	18-37	40
Practice	9.97 ± 1.74	3-13	14

Table 6. Comparison of knowledge, attitude, and practice scores according to demographic variables.

Domain Scores	Subgroup	Knowledge (Mean ± SD)	P-value	Attitude (Mean ± SD)	P-value	Practice (Mean ± SD)	P-value
Gender	Male	8.77 ± 1.82	0.02*	28.91 ± 3.72	0.76	9.90 ± 1.70	0.52
	Famale	8.12 ± 1.62		28.78 ± 3.33		10.05 ± 1.80	
Academic Year	Fifth Year	8.71 ± 1.87	0.04*	29.15 ± 3.70	0.45	9.82 ± 1.82	0.34
	Sixth Year	8.26 ± 1.51		28.61 ± 3.39		10.09 ± 1.69	

* Significant difference (P < 0.05).

Discussion

The present study evaluated the knowledge, attitude, and self-reported practice of senior dental students regarding fissure sealants. The findings indicated that while the students possessed an acceptable level of theoretical knowledge, their attitude and self-reported clinical practice were at a moderate level. This suggests a gap between theoretical learning and clinical application, a phenomenon often observed in medical and dental education. This observation aligns with earlier findings by Khami et al. [10], who also reported that while Iranian dental students possess good preventive knowledge, their practical performance requires more emphasis in the curriculum. Our results showed that fifth-year students scored significantly higher in the knowledge domain compared to sixth-year students. This finding can be attributed to the curriculum structure, in which pediatric dentistry courses and theoretical exams are concentrated in the fifth year. As students advance to the final year, their focus shifts towards comprehensive patient care, potentially leading to a decline in the recall of specific theoretical details. This highlights the need for continuous education and refresher courses before graduation to ensure retention of preventive dentistry concepts [15]. Regarding gender differences, male students in this study demonstrated significantly higher knowledge scores than females. This finding contrasts with several previous studies, such as those by San Martin et al. in Spain [14] and Ealla et al. in India [16], which reported no significant gender differences in knowledge. The observed difference in our study might be incidental or reflect specific study habits within this cohort rather than a fundamental gender disparity in aptitude. A crucial finding of this study was the positive correlation between knowledge/attitude and practice. However, despite relatively high knowledge scores (application technique), the translation of this knowledge into practice was not optimal. Similar discrepancies have been reported by Le Clerc et al. in

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France [17] and Nagappan et al. in India [18], where dental professionals demonstrated good knowledge but hesitated to apply sealants frequently due to perceived barriers, such as perceived difficulty. This observation is consistent with a 2023 study reporting that final-year dental students, despite having theoretical competency, often lack the self-confidence required for independent clinical decision-making [19]. Our study reinforces the idea that theoretical knowledge alone does not guarantee proper clinical performance.

Another point of concern was the students' attitude. While generally positive, there were misconceptions regarding the cost-effectiveness and durability of sealants compared to restorations. As noted by Al-Maweri et al. [20], negative or neutral attitudes can significantly hinder the adoption of preventive strategies. Current educational models proposed in 2023 suggest that integrating case-based learning and continuous clinical reinforcement in the final year is essential to bridge this theory-practice gap [21]. Therefore, dental curricula should not only focus on "how" to place a sealant but also emphasize the "why"—the long-term benefits and cost-effectiveness—to improve students' attitudes. This study had some limitations. First, the data were collected using a self-administered questionnaire, which is subject to social desirability bias; students might have reported better practices than they actually use. Second, the study was limited to one university (TUMS). However, it is the largest dental school in the country; the results may not be fully generalizable to all dental students in Iran.

Conclusion

Senior dental students at Tehran University of Medical Sciences demonstrated a satisfactory level of knowledge regarding fissure sealants, but their attitude and self-reported practice require improvement. The significant drop in knowledge scores among final-year students suggests a need to revise the curriculum to include retraining programs or case-based learning in the final year. Future studies incorporating direct clinical observation or auditing clinical records would provide a more accurate assessment of practice. Furthermore, to bridge the gap between knowledge and practice, clinical training should place greater emphasis on the practical application and cost-benefit analysis of preventive treatments.

Conflict of Interest

There is no conflict of interest to declare.

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