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Dental Students' Knowledge on Most Common Mouthwashes: A Cross-Sectional Study

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Abstract

Objective(s): Dentists have an important role in improving the knowledge of their patients regarding the indications and correct use of mouthwashes. The aim of the present study was to investigate the knowledge of dental students about commonly used mouthwashes for oral health. **Methods:** This cross-sectional study was conducted on 275 dental students from 8th to 12th semesters at Shahid Beheshti (N=150) and Babol Dental Schools (N=125) in 2021. A structured validated questionnaire consisting of 26 questions was used to assess students' knowledge regarding the prescription, indications, and side effects of four mouthwash types: chlorhexidine, fluoride, benzydamine, and anti-plaque. The questionnaire's content validity was ensured through expert review and calculation of the content validity ratio (CVR) and content validity index (CVI). Reliability was confirmed with a test-retest method and calculation of interclass correlation coefficient (ICC). Participants' responses were scored with scores categorized as low, medium, or high knowledge. Data was analyzed using Welch's ANOVA and independent T-tests (α= 0.05). **Results:** The overall mean of knowledge score was 11.22, with no significant difference between the two universities (p= 0.36). Knowledge scores did not differ significantly between male and female students. Students' knowledge about chlorhexidine and fluoride mouthwashes was significantly higher compared to benzydamine and anti-plaque mouthwashes(p =0.033). Students' knowledge about chlorhexidine mouthwash was significantly higher in the 11th and 12th semesters compared to the 8th and 9th semesters (p=0.03), while knowledge about fluoride mouthwash showed no significant difference across semesters (p=0.16). **Conclusion:** The present study revealed an overall low level of knowledge regarding the proper use, indications, and side effects of mouthwashes among dental students in Tehran and Babol. The findings underscore the necessity for dental schools to enhance their educational programs by providing more comprehensive instruction on the various types of mouthwashes, their appropriate uses, potential side effects, and associated benefits.

Keywords: Health Knowledge; Students; Dental; Mouthwashes

Introduction

Dental plaque is the main cause of dental caries and periodontal diseases, making plaque control an important component in dental management of patients [1]. The most basic way to prevent the accumulation of plaque is through mechanical removal including regular toothbrushing and flossing. However, in special oral conditions such as patients prone to periodontal diseases, high caries risk, those with mental and physical disabilities, or in individuals who lack the skills or motivation to mechanically remove dental plaque, chemical plaque control using moutwashes containing antimicrobial agents provides an important complement to mechanical oral hygiene measures [2–4]. Mouthwashes are common, easy to use products with preventive, therapeutic, and palliative purposes. They are effective in reducing infections, inflammation, and halitosis, in addition to relieving pain [5]. It is noteworthy that mouthwashes are not recommended for children under six years of age due to the high probability of swallowing [6].

Chlorhexidine is among the most commonly used mouthwashes in dentistry. It disrupts cell membranes, aiding in dental plaque control, caries prevention, reducing gingival or peri-implant inflammation, root canal chemical cleaning, post-surgical care and rendering halitosis [7,8]. Available in concentrations of 0.2%, 0.12%, and 0.06%, it is recommended for short-term microbial plaque control. Chlorhexidine's side effects include dry mouth, taste alteration, tongue discoloration, tooth discoloration, and less commonly, a burning sensation, parotid gland swelling, and mouth paresthesia [9,10].

Fluoride mouthwashes, primarily containing Sodium Fluoride, strengthen remineralization and prevent tooth decay by forming Fluoroapatite. Available in concentrations of 0.05% for daily use and 0.2% for weekly use, fluoride mouthwashes are recommended for people with high caries risk, tooth sensitivity, disabilities, dry mouth (due to Sjögren's syndrome or post-radiation therapy), and those receiving orthodontic treatment [11].

Anti-plaque mouthwashes improve brushing quality by loosening the attachment of microbial plaque to tooth surfaces or lowering tooth surface tension as pre-brush mouthrinse.

These mouthwashes (e.g. Plax mouthwash) are recommended for individuals with significant amount of microbial plaque[12,13]. Benzydamine mouthwash, containing 0.15% benzydamine hydrochloride, is a non-steroidal anti-inflammatory drug (NSAID) that inhibits prostaglandin formation, providing analgesic and anti-inflammatory effects [14]. It treats painful mouth and throat inflammations, such as tonsillitis, sore throat, and mucositis caused by radiotherapy or other conditions [14].

Dentists play a significant role in motivating their patients to maintain their oral health; therefore, they need to have sufficient information about indications and mechanism of action of each mouthwash in order to be able to prescribe them in case of need and educate their patients about them [5]. On the other hand, studies have shown that there is a lack of comprehensive knowledge among dental students regarding mouthwashes. For instance, a study conducted in Ghana, highlighted the need for more education on proper use of mouthwashes and their potential side effects [15]. Another study in Iran showed that a high percentage of dental students had poor to moderate knowledge about chlorhexidine, Listerine and fluoride mouthwashes [16].

The present study aimed to evaluate the knowledge of dental students at two dental schools in Tehran and Babol, Iran, regarding the most commonly used mouthwashes. The findings could be useful to identify knowledge gaps and perform educational interventions.

Methods

Study Design and Population

This cross-sectional study was conducted on 275 students of 8th - 12th semesters in Shahid Beheshti Dental School, Tehran, Iran (150 students) and Babol Dental School, Babol, Iran (125 students) in 2021. Sampling method was based on selecting participants from the target population or convenience sampling.

Questionnaire Design and Validation

Initially, based on various studies and textbooks [3, 4, 6, 11, 13, 14], and with the supervision of two experts from the periodontics department of dental school, Shahid Beheshti University of Medical Sciences, a structured questionnaire was developed regarding four mouthwash types (Chlorhexidine, Fluoride, Antiplaque, and Benzydamine). The questionnaire consisted of 26 questions, including three main parts (General knowledge about mouthwashes, Indications for use, and Side effects and precautions). The questionnaire is shown in appendix 1. The content of the questions included indications of mouthwashes, contraindications, side effects, and method of use. Each question was designed to test a specific aspect of knowledge, and participants were asked to select the correct answer(s) from multiple-choice options. Each correct response was awarded one point score. Given that some questions had several correct options, the possible range of total score for knowledge was 0-26, with 0 representing the lowest score. Reported sum of knowledge scores were then categorized as following: 0-9 as low, 10-18 as medium, and 19-26 as high knowledge.

To standardize the questionnaire, it was initially reviewed by ten professors from the community oral health and periodontics departments in dental school, Shahid Beheshti University of Medical Sciences. These experts rated the importance of each question using a five-point Likert scale based on their experiences. To assess content validity, questions were evaluated with regard to necessity, relevance, simplicity, and clarity, for measuring the intended goals. For content validity ratio (CVR), each question was rated based on necessity in terms of "necessary", "useful but not necessary", or "not necessary." CVR was calculated using the following formula:

$$CVR = [Ne - N/2] / [N/2].$$

According to Lawshe's table, with ten panel members, the minimum acceptable CVR value is 0.62 [17]. All questions met this criterion, indicating that no questions were omitted.

For the content validity index (CVI), each question was rated based on three criteria: relevance, simplicity, and clarity, using a 4-point Likert scale. To calculate CVI for each question, the total number of favorable points (sum of the 3th and 4th ranks) for each criterion (relevance, simplicity, and clarity) was divided by the total number of respondents. The average of these values was then computed based on the following formula:

$$CVI = [(CVIr) + (CVIc) + (CVIs)] / 3$$

The minimum required CVI for each item was 0.79 [18]. The CVI results indicated that all questions had scores above 0.79 and were therefore considered appropriate.

Face validity was also assessed considering ease of understanding, lack of ambiguity, adequacy, proper placement, and questionnaire integrity.

The questionnaire was distributed among the participants in the classroom by two members of the research team. To assess the reliability, the questionnaire was administered twice (test-retest) with a two-week interval. The agreement between the two answers was assessed using weighted kappa. The interclass correlation coefficient (ICC) was 0.94 ($p< 0.001$), indicating a strong agreement and that the questionnaire had proper reliability [19]. Finally, all 26 questions in the present study met criterions and were therefore considered as the final questionnaire.

Ethics

Study's protocol was approved by the Ethics Committees for Research at Shahid Beheshti University of Medical Sciences (IR.SBMU.RIDS.REC.1401.080). Students who consented to participate filled out the questionnaire, which was collected afterward.

Statistical Analysis

A total knowledge score and the mean and SD were first reported. Welch's ANOVA was used to compare the mean of

knowledge scores across the students in different semesters. Independent t-test was used to compare the means of knowledge scores between male and female for each university. Statistical significance was set at P-value < 0.05. Data was analyzed using SPSS version 27.

Results

A total of 275 students participated in this study, including 150 students (73 female and 77 male) from Dental School, Shahid Beheshti University of Medical Sciences, and 125 students (74 female and 51 male) from Dental School, Babol University of Medical Sciences. 60% of the participants in this study were students from Shahid Beheshti Dental School and 55% were students from Babol Dental School, all of whom were in semesters 8 through 12. All participants completed the entire questionnaire with no missing data. The age range of the participants was 21-30 years, with mean age of 23.3 (SD ±1.2) years. The mean ± SD of knowledge score for all students was 11.22 ±1.34. The score of students at Shahid Beheshti Dental School was 11.15, compared to 11.30 for students at Babol Dental School, with no statistically significant differences (p=0.36).

The mean knowledge scores for students in the 10th, 11th, and 12th semesters were significantly higher than those in the 8th and 9th semesters (p< 0.001). No significant difference was detected neither between 8th and 9th, nor between 10th, 11th, and 12th semester students (p=0.98 and p=0.49, respectively). Additionally, the highest knowledge scores were observed in the 11th semester students (Table 1).

Table 1- The relationship between academic semester and students' knowledge scores

Academic semester	Number of Students	Knowledge Score Mean (SD)	P-Value*
8th	53	[a]10.42 (0.15)	0.001
9th	48	[a]10.56 (0.16)	
10th	62	[b]11.43 (0.15)	
11th	56	[b]11.94 (0.19)	
12th	56	[b]11.57 (0.21)	

* Welch's ANOVA

At Shahid Beheshti Dental School, the mean knowledge score among males was higher compared to females, whereas at Babol Dental School, females exhibited a higher mean knowledge score than males. However, these differences were not statistically significant (p= 0.15 , and p=0.12, respectively).

As shown in Figure 1, the percentages of knowledge about the Benzydamine and Antiplaque mouthwashes were significantly lower than that for Chlorhexidine and Fluoride (p =0.033). When examining the differences in knowledge percentages across different semesters, it was found that for chlorhexidine mouthwash, the knowledge score in the 11th and 12th semesters was significantly higher than the 8th and 9th semesters (p=0.03). For fluoride mouthwash, there was no significant difference in knowledge across different semesters (p=0.16).

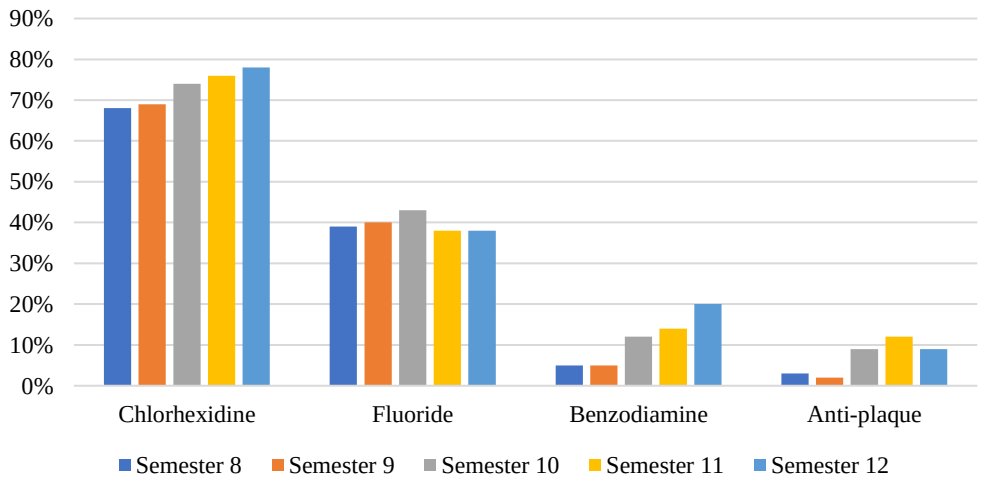

Figure 1: Students' Knowledge about chlorhexidine, fluoride, benzydamine, and antiplaque mouthwashes in different semesters

Discussion

The present study evaluated dental students' knowledge on Common mouthwashes. Overall, the findings revealed variations in students' knowledge levels across academic terms, as well as differences among various categories of mouthwash products.

In general, students in higher semesters demonstrated greater knowledge compared with those in earlier terms. This upward trend aligns with the expected progression of theoretical and clinical exposure throughout dental training. Similar results were reported by Khosravi et al., who found that students' understanding of mouthwashes improved with increasing educational level[16]. Also, the highest mean scores were observed among 11th-semester students, which may be attributed to the cumulative clinical experience and more advanced coursework completed at this stage. The

results of this study indicated no statistically significant difference in the knowledge levels of students from the two dental schools. This similarity in knowledge scores may be attributed to the identical curricula established by the Ministry of Health, suggesting that both faculties delivered similar educational content.

On the other hand, analysis of data showed that students were most familiar with chlorhexidine mouthwash, followed by fluoride mouthwash. This pattern is consistent with the findings of Shrestha et al., who reported greater awareness of commonly used mouthwashes, particularly chlorhexidine[20]. However, the ranking of fluoride (2nd place) knowledge in the present study contradicts the results of Alsulayhman et al., who found fluoride mouthwashes to be more widely understood[21]. Moreover, studies such as the one by MullaMushir have reported insufficient knowledge about chlorhexidine among dental students[22], highlighting possible curricular differences between countries. The relatively lower knowledge scores for benzydamine and anti-plaque mouthwashes may indicate reduced curricular emphasis on these products compared with chlorhexidine and fluoride.

An additional observation of this study was the lower awareness of chlorhexidine side effects among students in earlier terms. Since adverse effects typically arise with long-term or repeated use[9], students who have limited clinical follow-up experience may have fewer opportunities to encounter such cases. This gap underscores the influence of clinical exposure on knowledge retention and application. While this study provides valuable insights into the knowledge levels of dental students regarding mouthwashes, several limitations should be acknowledged: Sample Size and Generalizability: The study was conducted with students from only two dental schools, which may limit the generalizability of the findings to other institutions. A larger and more diverse sample could provide a more comprehensive understanding of dental students' knowledge across different educational contexts.

Potential Influence of External Factors: Factors such as personal experiences, prior exposure to mouthwash-related education, or clinical practice opportunities may have influenced students' knowledge levels but were not accounted for in this study. Understanding these variables could enhance the interpretation of results.

Limited Focus on Clinical Application: While the study assessed theoretical knowledge about mouthwashes, it did not evaluate students' ability to apply this knowledge in clinical settings. Future research should investigate how well students can translate their knowledge into practice when prescribing and recommending.

Considering the important role of mouthwashes in improving oral health in numerous studies and given the increasing demand for mouthwash use among patients, dentists must possess thorough knowledge of their indications, mechanisms, and potential side effects. [22–24] Enhancing educational strategies within dental curricula - particularly through case-based learning and clinical reinforcement- may improve students' readiness to prescribe appropriate products. Future research should also explore the long-term impact of strengthening mouthwash-related education on professional practice and patient oral health outcomes.

Conclusion

The present study highlights the overall low level of knowledge regarding the proper use, indications, and side effects of mouthwashes among dental students in Iran. Although knowledge scores were generally improved with advancing academic semesters, there was a clear discrepancy in students' knowledge, particularly regarding benzydamine and anti-plaque mouthwashes. The findings emphasize the need for dental schools to incorporate more comprehensive education on mouthwash products into their curricula, especially focusing on the various mouthwash types and their specific indications, side effects, and benefits.

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Author Contributions: S.SH & M.SH performed the study, calculations and analyzed the data. S.SH and F.AM supervised the project, provided critical feedback and helped shape the research. B.A and S.SH wrote the manuscript with input from all authors. All authors discussed the results, contributed and approved to the final manuscript.

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Informed Consent Statement: The first part of the questionnaire was designed to obtain participants' consent and assess their satisfaction with taking part in the study.

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

Using AI: All scientific content was prepared by the authors themselves.

Conflict of Interest: "No conflicts of interest to declare."

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