

## Evaluation of knowledge, approaches, and self-efficacy perceptions of Turkish dental students about preventive and interceptive orthodontic applications in 2018-2019

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Preventive orthodontics aids in the formation of normal occlusion. There have been numerous studies on this topic published in the literature. The purpose of this study was to assess final-year dental students' knowledge, attitudes, and self-efficacy perceptions of preventive and interceptive orthodontic applications (PIOA).

**METHODS:** Data were collected from 410 dental students from eight different faculties in this cross-sectional study using a pre-designed and validated self-administered, structured questionnaire. SPSS software was used to analyze the data, which included descriptive statistics, the independent samples t-test, analysis of variance (ANOVA), and the Kuder-Ritchardson Formula 20 (KR-20) reliability coefficient. The statistical significance level was set at  $P \leq 0.05$ .

**RESULTS:** The vast majority of students (71.0%) did not believe that they were qualified to perform PIOA after graduation. With a rate of 80.5%, preventive treatment was chosen as the most important treatment type. The most correctly answered question, with a score of 92.4%, was about space maintainers. The total score was calculated to be  $9.13 \pm 2.73$ . There was a significant difference in total scores between men and women ( $P = 0.0340$ ). There was a significant difference in total scores between those who thought and those who did not think that enough time had been allocated to theoretical education ( $P = 0.0001$ ). The total score differed significantly from the responses to the question "Do you believe you have sufficient theoretical and practical knowledge about PIOA?" ( $P = 0.0001$ ).

**CONCLUSION:** The women' knowledge level was higher than that of the men, and the students valued preventive measures. Experts should consider these findings when developing the core curriculum.

**KEYWORDS:** Preventive Orthodontics; Interceptive Orthodontics; Curriculum; Dental Student; Knowledge

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Malocclusion is a craniofacial disorder that affects the development of the gnathostomatic system of the teeth, jaw, and face.<sup>1</sup> Although malocclusion does not endanger general health, it is detrimental to oral health.<sup>2</sup> Preventive orthodontic treatments aid in the development of normal occlusion and the prevention of malocclusion.<sup>3</sup> When malocclusion develops, practices to ensure normal occlusion are referred to as interceptive orthodontic applications.<sup>3</sup> These applications are performed during the

primary or early mixed dentition phase to shorten and lessen the severity of orthodontic treatments.<sup>4</sup> Thanks to these applications, skeletal malocclusions can be corrected at a young age, and the possibility of tooth extraction decreases even if orthodontic treatment will be needed in the future. At the same time, treatment time is shortened, and the risk of periodontal disease decreases with enamel decalcification after treatment. Besides, the parental satisfaction with treatment increases.<sup>5</sup> The main advantage of these applications is that they are more

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comfortable and cheaper than traditional fixed devices and can be applied by experienced dentists.<sup>3</sup>

Theoretical and practical dentistry training period is 5 years in Turkey. Students who want to continue their specialty education in the field (such as periodontology, endodontics, pedodontics, etc.) must be trained according to their areas of expertise and practice.<sup>6</sup> Preventive dentistry has an essential place in this training given in the first five years. However, there are gaps in preventive dentistry applications in our country, and new approaches are required.<sup>7</sup> This situation makes us think whether there is a deficiency related to this field in the education given to us.

In Turkey, dental education programs usually concentrate on treatment, so that dentists consider the problems of patients technically and mechanically. Patient satisfaction could be ignored by dentists.<sup>8</sup> With their diagnostic and therapeutic properties, dentists support the lifestyle that increases oral and dental health.<sup>9</sup> It is worth mentioning that application training should be given accordingly. The goal of this study was to assess final-year dentistry students' knowledge, approaches, and self-efficacy beliefs concerning preventive and interceptive orthodontic applications (PIOA) at several Turkish universities, as well as to propose educational system reforms.

## Methods

**Ethical approval:** The study was approved by the Non-Interventional Clinical Research Ethics Committee of Sivas Cumhuriyet University, Sivas, Turkey (ethical code: 2019-02/34) after obtaining verbal and written consent from the participants. At the same time, necessary permissions were obtained from the faculties.

**Study samples:** The final-year dental students from eight different dental faculties in Turkey were investigated in this cross-sectional study (end of the second semester of the 2018-2019 academic year). The

participants were selected using convenience sampling method. Faculties were interviewed and eight faculties with the same curriculum in orthodontics course were selected. PIOA courses were given in the fourth year of dental education in these faculties. In this way, it was ensured that the students had taken this courses before receiving the questionnaire. Communication was established with the orthodontics department of the faculties, and necessary permissions were obtained. At the same time, assistants were determined to give the questionnaire to the students in these interviews. In total, 500 questionnaire forms were sent to the selected faculties by post, and 452 were filled in. The questionnaires were completed in the classrooms by the students themselves. Forty-two questionnaires were excluded because of some deficiencies, and finally, 410 questionnaires were evaluated. The target population of this study consisted of 84550 dental students in Turkey. It was aimed to reach 383 people with a 95% confidence interval (CI) and a 5% margin of error using the formula for sample size for finite universe [ $n = X^2NP(1-P) \div d^2(N-1) + X^2P(1-P)$ ].<sup>10</sup>

**Data collection:** The questionnaire consisted of 19 questions in total, including age and gender. The first four questions aimed to measure the approaches (question 1, question 3) and self-efficacy perceptions (question 2, question 4) of PIOA and 13 questions to measure the level of knowledge (question 5-question 17). The answers given to the items included two options: true and false. When the questions were answered, 1 point was given to correct answers and 0 point was given to incorrect answers. Thus, the total score was obtained by summing up the scores. The total knowledge level score ranged from 0 to 13. An increase in total score corresponded to an increase in knowledge. The responsible assistants explained the study's protocol to the students, and those who agreed to participate were included in the study.

To create the questionnaire, first, the literature was reviewed by searching the

keywords of “preventive orthodontics”, “preventive applications”, and “preventive knowledge level”. Then, a 25-item question tool was created by examining various articles written in Google Scholar, PubMed, and Web of Science databases,<sup>11-15</sup> and curricula of the selected faculties. The suitability of the prepared questions for the study content was reduced to 17 after the experts’ opinions (orthodontist and pedodontist) were taken. At the same time, the focus group interview was held with five students, and the comprehensibility of the questions in the questionnaire was evaluated. Questions that were difficult to understand were expressed more clearly. The final version of the survey was applied to 20 students who were not included in the study at 2-week intervals. Kuder-Ritchardson 20 (KR-20) reliability analysis of the collected questionnaires was made, and the reliability coefficient was found to be 0.739. Since this is a reasonably good ratio, no changes were made.

The collected data were analyzed using mean, standard deviation (SD), and frequency distributions by the SPSS software (version 22.0, IBM Corporation, Armonk, NY, USA). The KR-20 reliability coefficient of the questions prepared to measure the level of knowledge was calculated. The relationship between variables with two categories and the total score was evaluated by independent samples t-test, and the relationship between variables with more than two categories with the total score was assessed by analysis of variance (ANOVA) test. Post-hoc analysis in

non-homogeneous variances was analyzed by Tamhane’s T2 test.

## Results

The participants' average age was found to be 23.52 years. 59.8% (n = 245) of the individuals were women, 40.2% (n = 165) were men. The distribution and percentage of the answers given to 4 questions prepared to measure the approach and self-efficacy perception of PIOA are shown in table 1. The percentage of the answers given to 13 questions made to measure the level of knowledge are presented in table 2.

The overall score was  $9.13 \pm 2.73$ , based on the answers to 13 questions meant to test the students' level of knowledge. There was a significant difference between the total scores of women and men ( $P = 0.0340$ ). Women’s overall scores were found to be substantially higher than those of men. The highest correct answer was given about space maintainers (92.4%). A significant difference was observed between the total scores of those who thought and those who did not think that sufficient time was allocated to theoretical education ( $P = 0.0001$ ). The total scores of individuals who believed that adequate time was allocated to academic education were significantly high. There was a significant difference in total scores between those who thought they were capable of performing PIOA after graduation and those who did not ( $P = 0.0001$ ). Those who believed they were sufficient had much higher total scores.

**Table 1.** Distribution of subjects according to the approaches and self-efficacy perceptions of preventive and interceptive orthodontic applications (PIOA)

	Response	n = 410 [n (%)]
1. Do you think that the course time devoted to PIOA in theoretical orthodontic education is sufficient? (approaches)	Yes	248 (60.5)
	No	162 (39.5)
2. Do you feel sufficient to perform PIOA after graduation? (self-efficacy perceptions)	Yes	119 (29.0)
	No	291 (71.0)
3. Which treatment type do you think is the most important one? (approaches)	Preventive	330 (80.5)
	Interceptive	39 (9.5)
	Corrective	41 (10.0)
	Any	11 (2.7)
4. Do you think you have sufficient theoretical and practical knowledge about PIOA? (self-efficacy perceptions)	Some	298 (72.7)
	Very	70 (17.1)
	Too much	31 (7.6)

PIOA: Preventive and interceptive orthodontic applications

**Table 2.** Percentage of correct answers to questions that measure the level of knowledge about preventive and interceptive orthodontic applications (PIOA)

	Percentage of correct answers (%)
5. The bottle used in infancy should have a large hole.	65.6
6. Treatment of caries seen in primary or permanent teeth is evaluated within the scope of interceptive orthodontic treatment.	51.5
7. Oral hygiene education, fluoride applications, and fissure sealant applications are reviewed within the applications for the prevention of dental caries.	89.8
8. In the presence of newly extracted primary teeth, it is rare for the posterior teeth medialization towards the extraction cavity.	91.5
9. In the presence of premature loss of primary teeth, a space maintainer must be made to protect the space.	92.4
10. Suppose 1-2 mm is crowding in the lower incisors in the early mixed dentition period. In that case, it is necessary to extract the primary canine and ensure that the crowding spreads towards these spaces.	59.0
11. Series extraction is indicated in Angle Class I cases where bite does not increase, the lack of arch length is at least 7 mm, there is no skeletal problem and congenital tooth deficiency.	65.9
12. In series extraction, firstly, some primary teeth, and then, first permanent premolars are extracted.	77.8
13. Treatment of crossbites, which concern a single tooth especially in the central canine area, is of great importance for the correct positioning of the jaws and teeth. In this way, if a patient appears in the clinic where you work, the primary canine must be extracted.	51.5
14. In a patient who is in the late period of mixed dentition, no malocclusion is observed. Only in the upper right central tooth has a crossbite a removable appliance with labio-lingual spring can be performed to correct the crossbite.	73.9
15. The presence of a tooth that has not been erupted, although the age of eruption has come, is not a reason for malocclusion for the future periods.	82.2
16. When any oral habit (finger sucking, mouth breathing, etc.) is detected, habit-breaking appliances should be performed immediately.	61.5
17. For a verbal pattern (finger sucking, mouth breathing, etc.) to produce malocclusion, it must continue for a few weeks.	41.5

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There was no significant difference between the participants' overall scores and their answers to the question "Which sort of treatment was the most important?" ( $P = 0.1650$ ). However, the average total score of individuals who thought that preventive medicine was critical was higher. A

significant difference was observed between the answers given to the question "Do you think you have enough information about PIOA?" and the total score ( $P = 0.0001$ ). The average total score of those who believed they did not have enough information was significantly lower (Table 3).

**Table 3.** Relationship between approaches and self-efficacy perceptions and total score

		Total score (mean $\pm$ SD)	P
Gender	Female	9.37 $\pm$ 2.44	0.0340 <sup>*#</sup>
	Male	8.78 $\pm$ 3.00	
Question 1	Yes	9.64 $\pm$ 2.47	0.0001 <sup>*#</sup>
	No	8.35 $\pm$ 2.93	
Question 2	Yes	10.08 $\pm$ 2.70	0.0001 <sup>*#</sup>
	No	8.74 $\pm$ 2.66	
Question 3	Preventive	9.23 $\pm$ 2.64	0.1650 <sup>¥</sup>
	Interceptive	8.35 $\pm$ 3.24	
	Corrective	9.07 $\pm$ 2.89	
Question 4	Any	5.09 $\pm$ 2.87	0.0001 <sup>*¥,€,δ,σ</sup>
	Some	9.19 $\pm$ 2.70	
	Many	9.74 $\pm$ 2.23	
	Too much	8.61 $\pm$ 2.90	

SD: Standard deviation

<sup>\*</sup> $P < 0.05$ , <sup>#</sup>Independent samples t-test; <sup>¥</sup>One-way ANOVA

Tamhane post-hoc analysis, <sup>€</sup>Difference between any and some, <sup>δ</sup>Difference between any and many,

<sup>σ</sup>Difference between any and too much.

## Discussion

During the 5-year dentistry education, students are provided with necessary orthodontics information, but they need to receive specialist training to perform orthodontic treatment. The situation is somewhat different in PIOA. Non-specialist physicians can make these applications. Because of the inadequate number of orthodontists in Turkey, it is a significant problem that general dentists perform these applications. The answer to this question "whether there is sufficient emphasis on these practices in primary dentistry education" probably differs based on universities and countries. This study was conducted among final-year dental students who completed the clinical and field practice of PIOA. In recent years, there has been an increasing interest in examining dental students' knowledge, attitudes, competencies, and practices regarding preventive practices.<sup>16-21</sup> However, there is no study examining these applications in orthodontics.

According to the findings of the current study, 71% of dental interns did not believe that they were qualified to perform PIOA after graduation. At the same time, the majority (72.7%) believed that they lacked sufficient information. According to a study of Nepalese dentists, while most dentists reported a high level of general competence in providing preventive treatment and oral health education to their patients, their knowledge in some aspects of preventive dentistry was limited.<sup>11</sup> In another study evaluating dentists in Iran, it was concluded that dentistry education should be emphasized to update dentists' approaches and knowledge levels towards preventive practices.<sup>22</sup> Therefore, more importance should be given to PIOA.

The most important type of treatment was reported as preventive treatment with 80.5% rate. In a study conducted in Turkey in 2019, 40% of students reported that importance should be given to preventive dental practices.<sup>23</sup> Although this rate is not

consistent with the result of the present study, it carries findings regarding the importance of preventive methods.

The space maintainers prevent shortening of the arch length, and thus, the creation of malocclusion.<sup>24</sup> Control and management of dental spaces are common problems in preventive orthodontic applications.<sup>25</sup> That is why questions about space maintainers were added to the questionnaire in this study. The question that was answered most correctly was related to space maintainers. The second most correctly answered question was also indirectly associated with space maintainers. This result showed that we gave importance to space maintainers in our education system, and that was why the results were like this.

By evaluating the total scores obtained according to the gender variable, it was revealed that female students were theoretically better equipped. Female dentists are more competent than male dentists in providing oral hygiene training.<sup>11</sup> According to the study by Kumar et al., female students had better oral health knowledge than male students.<sup>26</sup> Ghasemi et al. found that female dentists had a more positive attitude towards preventive practices than their male counterparts.<sup>22</sup> According to the findings of this study, students who believed that adequate time was dedicated to theoretical instruction performed better. Bhardwaj et al. reported that most dentists had good knowledge and behavior in preventive dentistry and paid attention to preventive measures in their practice.<sup>27</sup> In another study, it was found that dental clinicians had sufficient knowledge and have positive attitudes towards preventive practices while treating their patients.<sup>28</sup> Preventive methods are given importance worldwide, and the results support this situation.

Students who felt themselves capable of doing PIOA were reported to be more successful after graduation. At the same time, individuals who believed that prevention was more important had higher total scores. The findings of this study are congruent with

those of Pratiwi et al., who found that having more information about the preventive application was linked to better preventive use.<sup>29</sup> The results of the present study are inconsistent with those reported by Folayan et al., indicating that Nigerian dental students' capacities for preventive practice were not related to age, gender, caries protection knowledge, and self-efficacy perception. Students who thought that they did not have sufficient theoretical and practical equipment for PIOA were found to be more unsuccessful.<sup>16</sup>

This study has also some limitations. The present study was conducted on eight different faculties with the same curriculum. These types of studies can also be applied to different faculties, larger groups of students, or graduated dentists. The questionnaire can be enriched with advanced studies, different case examples, and question types.

### Conclusion

Women who considered themselves adequate and believed that preventive

treatment was more important were more effective, according to the findings of this study. The vast majority of students did not believe that they were qualified to do PIOA after graduation, which was one of the most important findings. The need for PIOA is undoubtedly high, and experienced dentists can make such applications. Thus, these practices should be emphasized in dentistry education, deficiencies should be identified, necessary measures should be taken, and educated students should be equipped with sufficient equipment. In dental education, the issue of PIOA should be carefully created and emphasized in the preparation of the orthodontic curriculum. In terms of preventive applications, more in-depth studies with larger populations are needed.

### Conflict of Interests

Authors have no conflict of interest.

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