



## Dentistry Undergraduate Students' Views on Undergraduate and Postgraduate Dental Implantology Education: A Survey Study in Turkey

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### Research Article

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### ABSTRACT

**Objectives:** Dental implantology has become a contemporary and important component of dentistry practice, the importance of which is increasing. The fact that dental implantology has become an important treatment option in dentistry practice reveals the importance of implantology education. The aim of this survey study is to evaluate undergraduate and postgraduate dental implantology education in Turkey by undergraduate dentistry students.

**Materials and Methods:** A total of 233 5th year undergraduate dentistry students who completed dental implantology theoretical training from three different dentistry faculties were included in the study. Participants were asked to fill out a printed survey consisting of a total of 20 questions with different answer options. The survey aimed to obtain the participants' opinions on various topics such as implantology education, educational qualifications, practice authorizations, postgraduate dental implantology education, adequacy of courses, and standardization of education levels.

**Results:** A total of 233 participants (110 male, 123 female) were included in the study. The distribution of the answers to the survey questions according to the faculties was tabulated. The answers to the open-ended questions were categorized and classified. According to the results of the study, the participants think that dental implantology education provided until graduation in Turkey is inadequate. It is thought that the lack of education is especially in clinical practice and according to the study results, the practical aspect of dental implantology education should be strengthened. The study results indicate that dental implantology education in Turkey should be standardized at an international level and indicate that universities have an importance in this standardization.

**Conclusions:** Intern dentists do not consider themselves competent in performing dental implantology treatments after graduation, and the majority of participants find dental implantology courses useful. In addition, participants state that the courses should be provided by universities.

**Keywords:** Dental education, dental implants, graduate dental education, questionnaire

## Diş Hekimliği Lisans Öğrencilerinin Lisans ve Lisans Sonrası Dental İmplantoloji Eğitimi ile İlişkili Görüşleri: Türkiye’de Bir Anket Çalışması

### Araştırma Makalesi

#### Süreç

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### ÖZ

**Amaç:** Dental implantoloji, diş hekimliği pratiğinin içerisinde, önemi giderek artan, çağdaş ve önemli bir bileşen haline gelmiştir. Dental implantolojinin diş hekimliği pratiğinde önemli bir tedavi seçeneği haline gelmesi, lisans ve lisans sonrası diş hekimliği eğitiminde, lisans müfredatlarının ve implantoloji eğitimlerinin önemini ortaya koymaktadır. Bu anket çalışmasının amacı Türkiye’deki lisans ve lisans sonrası dental implantoloji eğitiminin lisans diş hekimliği öğrencileri tarafından değerlendirilmesidir.

**Gereç ve Yöntemler:** Çalışmaya üç farklı diş hekimliği fakültesinden dental implantoloji teorik eğitimini tamamlamış toplam 233 5’inci sınıf diş hekimliği lisans öğrencisi dâhil edildi. Katılımcılardan farklı cevaplandırma seçeneklerine sahip, toplam 20 sorudan oluşan basılı bir anketi doldurmaları istendi. Anket lisans diş hekimliği implantoloji eğitimi, eğitim yeterlilikleri, uygulama yetkileri, lisans sonrası dental implantoloji eğitimi, kursların yeterlilikleri, eğitim seviyelerinin standardizasyonu gibi farklı konular hakkında katılımcıların görüşlerini almayı amaçladı.

**Bulgular:** Çalışmaya toplam 233 (110 erkek, 123 kadın) katılımcı dâhil edildi. Anket sorularına verilen cevapların fakültele göre dağılımları tablolandırıldı. Açık uçlu sorulara verilen cevaplar kategorize edildi ve sınıflandırıldı. Çalışmanın sonuçlarına göre katılımcılar Türkiye’de mezuniyete kadar verilen dental implantoloji eğitiminin yetersiz olduğunu düşünmektedir. Eğitim eksikliğinin özellikle klinik uygulamalarda olduğu düşünülmektedir ve çalışma sonuçlarına göre dental implantoloji eğitiminin pratik yönü kuvvetlendirilmelidir. Çalışma sonuçları Türkiye’deki dental implantoloji eğitiminin uluslararası seviyede standardize edilmesi gerektiğini ifade etmektedir ve bu standardizasyonda üniversitelerin önemi olduğunu belirtmektedir.

**Sonuçlar:** Mezuniyet sonrası dental implantoloji içerikli tedavileri gerçekleştirmede stajyer diş hekimleri kendilerini yeterli görmemektedir ve katılımcıların büyük çoğunluğu dental implantoloji kurslarını faydalı görmektedir. Ayrıca katılımcılar kursların üniversiteler tarafından verilmesi gerektiğini ifade etmektedir.

**Anahtar Kelimeler:** Anket, diş hekimliği eğitimi, diş implantı, lisans diş hekimliği eğitimi

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## Introduction

Dental implantology has become an increasingly important, contemporary and important component of dentistry practice.<sup>1</sup> Dental implants are a unique treatment tool in modern dentistry that helps patients regain their normal function, aesthetics and health. In the last few decades, dentistry practice has undergone major changes in favor of dental implantology. Dental implant procedures are popular treatment methods among patients for the rehabilitation of edentulism with high success rates.<sup>2</sup>

The fact that dental implantology has become an important treatment option in dentistry practice reveals the importance of undergraduate curriculum and implantology education. Dentists who are particularly interested in dental implantology will encounter patients who have been rehabilitated through dental implant-supported prosthetic restorations more frequently each year and will increasingly face the necessity of dental implant surgery.<sup>3</sup>

There are a total of 105 dentistry faculties in active education in Turkey as of 2024, and dental implantology is included in the undergraduate curriculum in all dentistry faculties. Although it is included in the curriculum, the adequacy of dental implantology education is controversial. Dental implantology theoretical training in dentistry faculties in Turkey is generally given 2 hours a week for a period of 15 weeks. As far as is known, practical education varies in each faculty and its adequacy is generally debated. The idea that sufficient competence in dental implantology education cannot be achieved during undergraduate education directs many dentists to dental implantology courses after graduation.<sup>4</sup> Considering the variety of postgraduate courses, it is also thought that there is no standardization and that not every course will provide sufficient benefit to dentists. For these reasons, the development and expansion of undergraduate curricula is increasingly important.<sup>5,6</sup>

The demand for dental implant procedures, in addition to increasing patient awareness and expectations, has led to an expansion of the dental implant market. These results should prompt more accessible undergraduate dental implantology education. Clinical outcomes of dental implants placed by undergraduate students have been reported to be similar to those placed by experienced clinicians.<sup>7,8</sup> This result may prompt education providers to give undergraduate students more opportunities to practice dental implant surgery and break down prejudices. Also, undergraduate students reported that they needed additional training to perform dental implant surgery without supervision.<sup>6</sup>

Various studies have been conducted to evaluate the adequacy of undergraduate dental implantology education and the content and benefits of postgraduate dental implantology courses,<sup>3,4,9-11</sup> but no similar study was found when the literature in Turkey was examined. The purpose of this study is to evaluate undergraduate and postgraduate dental implantology education in Turkey by undergraduate dentistry students.

## Materials and Methods

The ethical suitability of this multicenter study was approved by the Tokat Gaziosmanpaşa University Clinical Research Ethics Committee [Registration Number: 24-KAEK-190 (Number: 83116987-418)] and the study was conducted in accordance with the Helsinki Ethical Principles Declaration. Verbal and written informed consent was obtained from all participants or their relatives who participated in the study. A total of 233 senior dentistry undergraduate students from three different dentistry faculties (Tokat Gaziosmanpaşa University, Uşak University, and Sakarya University) were included in the study.

Senior dentistry students who could read and write Turkish at an advanced level, who successfully completed the dental implantology theoretical course and the oral and maxillofacial surgery clinical internship course, and who had been studying at the same faculty for at least three years were included in the study. Inclusion and exclusion criteria were determined in this way and participants who did not meet the criteria were excluded from the study. Participants were asked to complete a printed questionnaire consisting of a total of 20 questions with different response options (Figure 1). The survey aimed to obtain the participants' opinions on various topics such as undergraduate dental implantology education, educational qualifications, practice authorizations, postgraduate dental implantology education, adequacy of courses, standardization of education levels. Similar studies were taken into consideration in the preparation of the survey and adaptations were made taking into account the opinions of the co-authors.<sup>4,11</sup> Completed surveys were grouped according to faculties and the results were evaluated statistically.

### Statistical Analysis

The normality distribution of the study data was checked with the Kolmogorov-Smirnov test before subjecting it to statistical analysis. In addition, verification was made with Skewness and Kurtosis values (between -1.5 and +1.5). It was checked whether the variances were homogeneous. In the analysis of single-answer questions in the survey (in the evaluation of qualitative data), cross tables, chi-square ( $\chi^2$ ) and Fisher Exact tests were used. In the analysis of questions in the survey where more than one option could be marked, frequency distribution and chi-square ( $\chi^2$ ) tests were used. IBM SPSS 24 (SPSS inc., an IBM Co., Somers, NY) programs were used for the analyses. Statistical significance was determined as  $p < 0.05$ . 95% confidence interval was used in the hypothesis test.

In the calculation of the sample size for the given sample frame; A 95% power, 5% margin of error and 0.30 effect size model was constructed and the G\*Power (version 3.1.9.4) program was used to determine the sample size. The sample size calculated with these values was determined as 220 and the study was completed with a total of 233 participants.

- | Age:  | Gender:  |                                 |
|---|--|---------------------------------|
| 1. <u>Do you think that the dental implantology knowledge you were taught until your graduation was sufficient?</u>             |  |                                 |
| A. Yes  | B. No  |                                 |
| 2. <u>Do you feel ready to perform dental implant treatments?</u>   |  |                                 |
| A. Yes  | B. No  |                                 |
| 3. <u>What are the educational gaps related to dental implantology in the lead up to graduation?</u>                            |  |                                 |
| 4. <u>What would you like to see changed in dental implantology education to improve your learning process?</u>                 |  |                                 |
| 5. <u>What do you plan to do to improve yourself in implantology after graduation?</u>  |  |                                 |
| A. Following written sources (books, journals, etc.)  | C. Online trainings and internet use                             |                                 |
| B. Participating in congresses and seminars   | D. Dental implant courses  |                                 |
| 6. <u>Do you think dental implant courses are useful?</u>   |  |                                 |
| A. Yes  | B. No  |                                 |
| 7. <u>Which institutions should provide implant courses?</u>  |  |                                 |
| A. Universities   | C. Certified / Accredited Private Education and Course Centers   |                                 |
| B. Professional associations  | D. Implant companies   |                                 |
| 8. <u>What higher level courses should include?</u>   |  |                                 |
| A. Theoretical lessons  | D. Certificate of participation                                  | G. Patient planning             |
| B. Working groups   | E. Hands-on courses  | H. Practices on the patient     |
| C. Scientific studies   | F. Surgical assists  |                                 |
| 9. <u>What kind of information should be conveyed in implant courses?</u>   |  |                                 |
| A. Beginner level implantology training   | D. Implant supported dentures                                    |                                 |
| B. Advanced implantology training   | E. Orthodontic implants  |                                 |
| C. Augmentations  | F. Current implantology topics                                   |                                 |
| 10. <u>Which topics are likely to attract particular interest in implant courses?</u>   |  |                                 |
| A. Beginner level implantology training   | D. Implant supported dentures                                    |                                 |
| B. Advanced implantology training   | E. Orthodontic implants  |                                 |
| C. Augmentations  | F. Current implantology topics                                   |                                 |
| 11. <u>Which topics are particularly likely to receive low interest in implant courses?</u>                                     |  |                                 |
| A. Beginner level implantology training   | D. Implant supported dentures                                    |                                 |
| B. Advanced implantology training   | E. Orthodontic implants  |                                 |
| C. Augmentations  | F. Current implantology topics                                   |                                 |
| 12. <u>What do you think is the average time required for implant courses?</u>  |  |                                 |
| A. Hours  | C. Weeks   | E. Years                        |
| B. Days   | D. Months  |                                 |
| 13. <u>Who do you think should have the authority to perform dental implants?</u>   |  |                                 |
| A. General dentists   | D. Oral implantology specialists                                 | G. Other                        |
| B. Oral and maxillofacial surgeons  | E. Prosthetic dentistry specialists                              |                                 |
| C. Periodontology specialists   | F. Some medical departments                                      |                                 |
| 14. <u>Who do you think usually attends implant courses?</u>  |  |                                 |
| A. Dentistry students   | D. Periodontology specialists                                    | G. Other                        |
| B. Dentists   | E. Endodontics specialists                                       |                                 |
| C. Prosthetic dentistry specialists   | F. Orthodontists   |                                 |
| 15. <u>Who usually performs dental implant applications?</u>  |  |                                 |
| A. Oral and maxillofacial surgeons  | C. Prosthetic dentistry specialists                              | E. Other                        |
| B. General dentists   | D. Periodontology specialists                                    |                                 |
| 16. <u>What should be the minimum requirements for dental implantology training?</u>  |  |                                 |
| A. Theoretical trainings  | C. Surgical assists  | E. Follow-up cases and evidence |
| B. Hands-on courses   | D. Case documents  |                                 |
| 17. <u>What level of standardized training should there be in implantology?</u>   |  |                                 |
| A. National level   | B. European level  | C. International level          |
| 18. <u>Which institutions or organizations should be responsible for the development of standardized implantology training?</u> |  |                                 |
| A. Universities   | D. Certified / accredited private education and training centers |                                 |
| B. International professional associations  | E. Public institutions and organizations                         |                                 |
| C. National professional associations   |  |                                 |
| 19. <u>Who should be the organizers of dental implantology education?</u>   |  |                                 |
| A. Universities   | C. Professional chambers or associations                         |                                 |
| B. Certified/accredited private education and training centers  | D. Professional organizations                                    |                                 |
| E. None   |  |                                 |
| 20. <u>What are the critical aspects of implantology education nationwide?</u>  |  |                                 |
| A. Inadequate educational opportunities   | F. Dominance of commercial companies in courses/training         |                                 |
| B. Inadequate theoretical courses in universities   | G. Courses are not standardized and their quality varies         |                                 |
| C. Inadequate student participation in patient practices at universities  | H. Lack of defined qualifications and quantities for trainers    |                                 |
| D. Insufficient number of surgical observations in universities   | I. Not enough courses  |                                 |
| E. Lack of practical training in courses or universities  | J. Too many courses  |                                 |

Figure 1. Survey Sample.

## Results

A total of 233 participants (110 male, 123 female) were included in the study, 102 from Tokat Gaziosmanpaşa University, 70 from Uşak University and 61 from Sakarya University. The distribution of the responses to the survey

questions by faculties is shown in Table 1 and Table 2 (a, b). The tables were created according to the criterion that the responses to the survey questions could be single-answer or multiple-answer. The responses to the open-ended questions were classified.

Table 1. Chi-square test results for single-answer questions

Question number	Variables	Faculty			p value
		Tokat n (%)	Uşak n (%)	Sakarya n (%)	
Q1-Do you think that the dental implantology knowledge you were taught until your graduation was sufficient?	No	67 (28.8)	53 (22.7)	41 (17.6)	0.351
	Yes	35 (34.3)	17 (22.2)	20 (32.8)	
Q2-Do you feel ready to perform dental implant treatments?	No	76 (32.6)	60 (25.8)	48 (20.6)	0.208
	Yes	26 (25.5)	10 (14.3)	13 (21.3)	
Q3-What are the educational gaps related to dental implantology in the lead up to graduation?	Practical	77 (33)	24 (10.3)	37 (15.9)	<0.001*
	Theoretical	4 (1.7)	32 (13.7)	13 (5.6)	
	Practical + Theoretical	21 (9)	14 (6)	11 (4.7)	
	Observation	0 (0)	0 (0)	0 (0)	
Q4-What would you like to see changed in dental implantology education to improve your learning process?	Practical	73 (31.3)	37 (15.9)	37 (15.9)	0.009*
	Theoretical	3 (1.3)	15 (6.4)	6 (2.6)	
	Practical + Theoretical	19 (8.2)	16 (6.9)	16 (6.9)	
	Training on the model	5 (2.1)	2 (0.9)	2 (0.9)	
	Observation	2 (0.9)	0 (0)	0 (0)	
Q6-Do you think dental implant courses are useful?	No	3 (1.3)	2 (0.9)	1 (0.4)	0.865
	Yes	99 (42.5)	68 (29.2)	60 (28.5)	
Q12-What do you think is the average time required for implant courses?	Hourly	1 (0.4)	1 (0.4)	2 (0.9)	0.813
	Daily	24 (10.3)	18 (7.7)	19 (8.2)	
	Weekly	48 (20.6)	26 (11.2)	22 (9.4)	
	Monthly	27 (11.6)	23 (9.9)	17 (7.3)	
	Annually	2 (0.9)	2 (0.9)	1 (0.4)	
Q15-Who usually performs dental implant applications?	Oral and maxillofacial surgeons	76 (32.6)	52 (22.3)	42 (18)	0.145
	General dentists	20 (8.6)	6 (2.6)	10 (4.3)	
	Prosthetic dentistry specialists	2 (0.9)	1 (0.4)	0 (0)	
	Periodontology specialists	4 (1.7)	10 (4.3)	8 (3.4)	
	Other	0 (0)	1 (0.4)	1 (0.4)	
Q17-What level of standardized training should there be in implantology?	National	7 (3)	5 (2.1)	4 (1.7)	0.042*
	Europe	8 (3.4)	17 (7.3)	13 (5.6)	
	International	87 (37.3)	48 (20.6)	44 (18.9)	

\*: Statistically significant.

No statistically significant difference was observed between faculties in Question 1 ( $p = 0.351$ ). 69.1% of the participants stated that the dental implantology education provided until graduation was inadequate. No statistically significant difference was observed between faculties in Question 2 ( $p = 0.208$ ), but 79% of the participants stated that they did not consider themselves competent to perform dental implant treatments. In Question 3, statistically significant differences were observed in total participant responses ( $p < 0.001$ ). 59.2% of the participants stated that practical training was insufficient. The results of the responses given to Question 4 were in favor of strengthening the practical aspect of dental implantology training and were statistically significant ( $p = 0.009$ ). When the responses given to Question 6 were evaluated, 97.4% of the participants stated that dental implant courses were beneficial. When the responses given to Question 12 were evaluated, the course durations were preferred by the participants as weekly (41.2%), monthly (28.8%) and daily (26.2%). When the responses given to Question 15 were examined, it was determined that 73% of dental implant applications were performed by oral and maxillofacial surgeons. Statistically significant differences were observed in Question 17 ( $p = 0.042$ ). The participants stated that standardized dental implantology training should be at an international level.

Questions 5, 7, 8, 9, 10, 11, 13, 14, 16, 18, 19 and 20 were classified in Tables 2a and 2b due to their multiple-choice responses. When the responses to Question 5 were evaluated, no statistically significant difference was observed ( $p = 0.645$ ). Question 7 aimed to evaluate which institutions or organizations should provide dental implant courses. Although no statistically significant difference was observed in the results ( $p = 0.118$ ), 53.3% of the participants stated that the courses should be provided by universities. In Question 8, no statistically significant difference was observed in terms of participant responses, both among universities and in terms of total participant responses ( $p = 0.309$ ). When the total participant responses to Question 9 were evaluated, a weak preference was observed for orthodontic implants to be included in dental implant courses, and this result was statistically significant ( $p = 0.009$ ). Question 10 aimed to assess which topics would be the focus of attention in dental implant courses. The results were not observed to be statistically significant ( $p = 0.095$ ). Question 11, which aimed to assess a similar orientation, showed statistically significant results when the total participant responses were evaluated ( $p = 0.019$ ). The results in questions 13 and 14 were not observed to be statistically significant ( $p = 0.328$ ,  $p = 0.213$ , respectively). Question 16 asked participants to assess which minimum requirements dental implantology courses should meet. No statistically

significant difference was observed between participant responses ( $p = 0.306$ ). No statistically significant difference was observed in the responses given to Question 18, which assessed which institutions and organizations should be active in the development of a standardized implantology education, in the comparison between faculties ( $p = 0.247$ ). Question 19 aimed to evaluate who should be the organizers of dental implantology education through participant responses,

and no statistical significance was observed in the results ( $p = 0.113$ ). Finally, Question 20 aimed to evaluate the deficiencies and critical aspects of dental implantology education on a national scale through participant responses. The answers given to question 20, which included 10 different options, were observed to be statistically significant ( $p = 0.002$ ). Participants focused on the inadequacy of practical training in dental implantology education on a national scale.

Table 2a. Multiple-answer questions and distribution of answers

Question number	Question details-options	Faculty			p value
		Tokat n (%)	Uşak n (%)	Sakarya n (%)	
Q5-What do you plan to do to improve yourself in implantology after graduation?	Following written sources	42 (7.6)	26 (4.7)	26 (4.7)	0.645
	Participating in congresses and seminars	66 (11.9)	47 (8.5)	41 (7.4)	
	Online trainings and internet usage	42 (7.6)	22 (4)	24 (4.3)	
	Dental implant courses	93 (16.7)	68 (12.2)	59 (10.6)	
Q7-Which institutions should provide implant courses?	Universities	95 (23)	69 (16.7)	56 (13.6)	0.118
	Professional associations	12 (2.9)	11 (2.7)	9 (2.2)	
	Accredited private education and training centers	61 (14.8)	29 (7)	37 (9)	
	Implant Companies	14 (3.4)	8 (1.9)	12 (2.9)	
Q8-What higher level courses should include?	Theoretical Lessons	78 (6)	64 (4.9)	48 (3.7)	0.309
	Working Groups	53 (4.1)	31 (2.4)	37 (2.8)	
	Scientific studies	53 (4.1)	30 (2.3)	29 (2.2)	
	Participation certificate	80 (6.1)	48 (3.7)	47 (3.6)	
	Hands-on courses	89 (6.8)	64 (4.9)	56 (4.3)	
	Surgical assists	53 (4.1)	30 (2.3)	26 (2)	
	Patient planning	75 (5.8)	61 (4.7)	52 (4)	
Applications on the patient	86 (6.6)	57 (4.4)	54 (4.2)		
Q9-What kind of information should be conveyed in implant courses?	Beginner level implantology training	79 (8.2)	67 (7)	53 (5.5)	0.009*
	Advanced implantology training	93 (9.7)	53 (5.5)	54 (5.6)	
	Augmentations	68 (7.1)	45 (4.7)	42 (4.4)	
	Implant supported dentures	81 (8.4)	55 (5.7)	49 (5.1)	
	Orthodontic implants	31 (3.2)	14 (1.5)	13 (1.3)	
	Current implantology topics	81 (88.4)	43 (4.5)	42 (4.4)	
Q10-Which topics are likely to attract particular interest in implant courses?	Beginner level implantology training	62 (8.1)	51 (56.6)	41 (5.3)	0.095
	Advanced implantology training	87 (11.3)	44 (5.7)	44 (5.7)	
	Augmentations	47 (6.1)	35 (4.6)	32 (4.2)	
	Implant supported dentures	76 (9.9)	54 (7)	41 (5.3)	
	Orthodontic implants	18 (2.3)	10 (1.3)	10 (1.3)	
	Current implantology topics	56 (7.3)	33 (4.3)	28 (3.6)	
Q11-Which topics are particularly likely to receive low interest in implant courses?	Beginner level implantology training	35 (9.4)	9 (2.4)	16 (4.3)	0.019*
	Advanced implantology training	9 (2.4)	6 (1.6)	6 (1.6)	
	Augmentations	29 (7.8)	13 (3.5)	13 (3.5)	
	Implant supported dentures	11 (3)	1 (0.3)	2 (0.5)	
	Orthodontic implants	71 (19.1)	57 (15.4)	45 (12.1)	
	Current implantology topics	18 (4.9)	15 (4)	15 (4)	

\*: Statistically significant.

## Discussion

Dental implant-supported oral rehabilitation of partially edentulous or completely edentulous patients has become an important dental practice worldwide, including in Turkey. Considering the increasing demand from patients and the area it covers in the dentistry economy, dental implantology is bound to grow and progress. dentistry faculties need to take this fact into consideration when preparing dental implantology curricula and newly graduated dentists need to be more equipped in implant dentistry before graduation. The increasing demand for the

development of implant dentistry education brings with it challenges such as integrating students into clinical implantology, revising, developing and constantly updating dental implantology curriculum content. These challenges generally pave the way for dental implantology education to be skipped superficially at the undergraduate level. When all these complex and cumbersome education and training processes are evaluated, the criticism that dentistry school curricula lag behind contemporary dentistry practices is observed as a realistic comment.<sup>2,10-12</sup> It is an accepted fact that these deficiencies observed in undergraduate dentistry education direct newly graduated

dentists to dental implantology courses for both basic and advanced implantology applications. The main purpose of our study is to evaluate the dental implantology education

given during the undergraduate dentistry education and the post-graduation dental implantology courses by senior dentistry students.

Table 2b. Multiple-answer questions and distribution of answers

Question number	Question details-options	Faculty			p value
		Tokat n (%)	Uşak n (%)	Sakarya n (%)	
Q13-Who do you think should have the authority to perform dental implants?	General dentists	47 (6.8)	24 (3.5)	32 (4.6)	0.328
	Oral and maxillofacial surgeons	98 (14.2)	68 (9.8)	58 (8.4)	
	Periodontology specialists	74 (10.7)	39 (5.6)	41 (5.9)	
	Oral implantology specialists	68 (9.8)	37 (5.3)	35 (5.1)	
	Prosthetic dentistry specialists	24 (3.5)	19 (2.7)	17 (2.5)	
	Some branches of medicine	4 (0.6)	2 (0.3)	3 (0.4)	
	Other	1 (0.1)	0 (0)	1 (0.1)	
Q14-Who do you think usually attends implant courses?	Dentistry students	49 (8.2)	31 (5.2)	27 (4.5)	0.213
	Dentists	102 (17)	70 (11.6)	60 (10)	
	Prosthetic dentistry specialists	54 (9)	27 (4.5)	23 (3.8)	
	Periodontology specialists	46 (7.7)	28 (4.7)	26 (4.3)	
	Endodontics specialists	13 (2.2)	2 (0.3)	5 (0.8)	
	Orthodontists	11 (1.8)	2 (0.3)	3 (0.5)	
	Other departments	11 (1.8)	5 (0.8)	6 (1)	
Q16-What should be the minimum requirements for dental implantology training?	Theoretical trainings	84 (11.3)	52 (7)	47 (6.3)	0.306
	Hands-on courses	87 (11.7)	60 (8)	54 (7.2)	
	Surgical assists	48 (6.4)	34 (4.6)	22 (2.9)	
	Case documents	67 (9)	37 (5)	30 (4)	
	Follow-up cases and evidence	57 (7.6)	35 (4.7)	32 (4.3)	
Q18-Which institutions or organizations should be responsible for the development of standardized implantology training?	Universities	95 (19)	66 (13.2)	51 (10.2)	0.247
	International professional associations	46 (9.2)	25 (5)	29 (5.8)	
	National professional associations	21 (4.2)	10 (2)	16 (3.2)	
	Certified / Accredited Private Education and Course Centers	51 (10.2)	30 (6)	30 (6)	
	Public Institutions and Organizations	10 (2)	10 (2)	10 (2)	
Q19-Who should be the organizers of dental implantology education?	Universities	96 (18.2)	60 (11.4)	52 (9.8)	0.113
	Certified / Accredited Private training and course centers	60 (11.4)	29 (5.5)	31 (5.9)	
	Professional chambers or associations	22 (4.2)	12 (2.3)	18 (3.4)	
	Professional organizations	64 (12.1)	43 (8.1)	41 (7.8)	
Q20-What are the critical aspects of implantology education nationwide?	Inadequate educational opportunities	66 (5.4)	47 (3.9)	45 (3.7)	0.002*
	Inadequate theoretical courses in universities	56 (4.6)	53 (4.4)	43 (3.5)	
	Inadequate student participation in patient practices at universities	89 (7.3)	43 (3.5)	45 (3.7)	
	Insufficient number of surgical observations in implant surgeries at universities	47 (3.9)	20 (1.6)	26 (2.1)	
	Lack of practical training in courses or universities	83 (6.8)	51 (4.2)	50 (4.1)	
	Dominance of commercial companies in courses/training	53 (4.4)	32 (2.6)	34 (2.8)	
	Courses are not standardized and their quality varies	61 (5)	34 (2.8)	37 (3)	
	Lack of defined qualifications and quantities for trainers	46 (3.8)	24 (2)	27 (2.2)	
	Not enough courses	19 (1.6)	20 (1.6)	15 (1.2)	
	Too many courses	20 (1.6)	16 (1.3)	12 (1)	

\*: Statistically significant.

Participant responses to questions 2, 3, and 4 provide useful insights into dental implantology education in Turkey. When the main results of the study are evaluated, 69.1% of the participants state that the dental implantology education they received is not sufficient. This result is similar to the literature.<sup>1,13,14</sup> As a similar result, again in the current study, 79% of the participants do not see themselves as competent in performing dental implant treatments after graduation. A significant portion

of the participants (59.2%) state that practical training in dental implantology education given at the undergraduate level is insufficient and that the practical aspect of dental implantology education should be strengthened. In addition, as a similar result, the participants state that there are deficiencies in the practical aspect of dental implantology education on a national scale. Although the study results reflect the views of students from 3 dentistry faculties in Turkey, the

authors think that the situation is similar in other dentistry faculties in Turkey. This result is generally consistent with the literature data<sup>2,10,15-17</sup> and also reflects the international dimension of the problem. Lack of dental implantology education, especially in clinical practices, is a problem both nationally and internationally and is attracting more attention over time. Another important issue when the study results are evaluated is the need for dental implantology education to be standardized at an international level. Participants also stated that standardization in dental implantology education should be the responsibility of universities. These results reveal the need to revise dental implantology education on a national scale. Another conclusion to be drawn from our current study is that, according to the total participant responses, 73% of dental implantology applications are performed by oral and maxillofacial surgeons. This idea may be exaggerated in a treatment protocol such as dental implantology, which requires a multidisciplinary approach and integrates many specialties. The main factor that led the participants to this idea is that a significant portion of undergraduate dental implantology education in Turkey is undertaken by Oral and Maxillofacial Surgery Departments. This result also supports the need to revise undergraduate dental implantology education in Turkey.

Integrating dental implantology education into undergraduate dentistry education in all its aspects brings with it certain problems. Patients undertaking an economic burden and demanding the best treatment from expert clinicians, faculty members' idea of having control over dental implant procedures that involve a long-term treatment and follow-up process and their responsibilities in treatments, possible complications, and including undergraduate students in dental implantology treatments without sufficient clinical observation time are among the concerns of education providers and patients. It is observed as an important issue to revise undergraduate dental implantology education in order to eliminate the concerns of responsible faculty members and patients. Literature data shows that the success rates observed in dental implants and prosthetic restorations placed by undergraduate dentistry students are at similar levels to the success rates observed in treatments performed by experienced clinicians.<sup>8,18,19</sup> These results should be a triggering factor in the inclusion of undergraduate dentistry students in dental implantology clinical practices and should encourage faculty members. In addition, financial advantages can be created to reduce patient anxiety or at least make it tolerable, and this can be a decisive factor for patients.

The idea that pre-graduation dental implantology education is inadequate directs dentists to attend dental implantology courses after graduation. In Turkey, courses generally do not have any standardization and are structured in various durations and contents. Nationally given courses are generally organized by dental implant companies, and theoretical education and implementation of applications are usually provided by contracted expert clinicians. Depending on the scope of

the courses, theoretical education, case presentations, practical training on models, training on human or animal cadavers and patient applications are included. Very few courses have most of these qualifications in terms of scope. In addition, the activities of dental implant companies in course organizations also give the trainings a commercial mission. When the results of our current study are evaluated in terms of total participant responses, 97.4% of the participants state that postgraduate dental implantology courses are useful. Similarly, 53% of the participants state that dental implantology courses should be given by universities. In a 2022 study conducted in Tehran, 90% of dentistry students who participated in the study expressed interest in postgraduate dental implantology courses.<sup>11</sup> In a similar study<sup>20</sup> conducted in Nepal in 2018, a large proportion of trainee dentists expressed dissatisfaction with undergraduate dental implantology education and stated that they were eager to learn more after graduation. In a similar study<sup>21</sup> conducted in India in 2013, 95.7% of trainee dentists reported that undergraduate dental implantology education was not sufficient and that they were eager to learn more. Similar studies and the current study results are very similar, and the implications of the current study results for postgraduate dental implant courses are consistent with the literature.

Among the limitations of the study, several points stand out. The study results focus on the participants' responses to the survey. More objective criteria such as participants' exam performance, criteria for evaluating practical skills, and measurement of student competencies need to be evaluated in further studies. Additionally, the differences in dental implantology education between countries may create limitations in evaluating the results of the study at the international level.

## Conclusions

The results of the current study show that dental implantology education provided until graduation in Turkey is inadequate when the responses given by the participants are evaluated. Lack of education is observed especially in clinical practices and according to the study results, the practical aspect of dental implantology education should be strengthened. The study results indicate that dental implantology education in Turkey should be standardized at an international level and emphasize the importance of universities in this standardization. Intern dentists do not see themselves as competent in performing dental implantology treatments after graduation and almost all of them find dental implantology courses useful. In addition, participants state that the courses should be provided by universities.

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## Conflicts of Interest Statement

The authors declared no conflict of interest.

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