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The New Normal in Dental Education: Perceptions of e-Learning Among Dental Students and The Impact of The Pandemic on Education

Gözde Haksayar [1],* and Cengiz Evli [2]

[1]Department of Oral and Maxillofacial Radiology, Institute of Health Sciences, Ankara University, Ankara, Turkey and [2]Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Ankara University, Ankara, Turkey

*Corresponding Author; gozde.haksayar@hotmail.com

Abstract

Dentistry education, unlike other professional programs, consists of three core components: theoretical education, laboratory (pre-clinical) practices, and clinical training. These components, along with various social programs, research projects, and interdisciplinary experiences, are highly integrated. With the global accessibility of the internet, especially during the COVID-19 pandemic, there has been a shift toward virtual learning across many fields. However, the unique structure of dentistry education has limited the widespread implementation of distance learning strategies.

Aim and Method: : This review aims to evaluate the perceptions of dentistry students regarding distance learning and in-class education, especially in the context of the COVID-19 pandemic. A detailed literature review was conducted, and relevant findings were summarized.

Conclusions: Zhang et al.'s survey showed that 53.8% of students reported difficulty recalling material during distance learning, and 64.1% found it harder to concentrate compared to face-to-face lessons. Additionally, 79.5% experienced fatigue during online education. Despite challenges in practical training, students generally felt they had received adequate pre-clinical education. The pandemic impacted both learning and practical training, with students expressing fear of infection. Distance learning with interactive activities, quality materials, and well-organized modules can improve students' learning experiences and satisfaction, providing guidance for future educational models.

Key words: COVID-19; Dentistry education; Digital learning; E-learning; Pandemic

Introduction

The integrated curriculum is becoming a popular concept among dental schools, incorporating both theoretical and clinical practices[1]. In the realm of higher education, digital transformation can be understood as the combination of all digital processes necessary to achieve this transformation. This process provides higher education institutions with opportunities to effectively and optimally utilize digital technologies . However, the COVID-19 pandemic, although no longer classified as an active global pandemic, led has led to serious consequences in multiple areas, including economic, social, and health-related issues, and it has notably influenced the field of dental education[2]. Because of lockdowns and government guidelines aimed at curbing the spread of COVID-19, dental teaching activities allowed in universities were significantly restricted. The pandemic has led to significant changes in education systems worldwide, and the adaptation of dental students to e-learning pro-cesses, along with its impact on the quality of education, has played a critical role in defining new norms in dental education.[3]

The adoption of e-learning during COVID-19 revealed significant regional disparities. In Germany, over 80% of faculty successfully adapted to online teaching, demonstrating the country's competence in digital education[4]. Conversely, Turkey and the USA faced significant difficulties, particularly in delivering practical training and hands-on experience, which are key components of dental education[5]

This review analyzes these challenges, identifies regional disparities, and evaluates innovative solutions such as hybrid learning and AR/VR technologies to inform more resilient approaches in dental education.

Table 1. Comparative Analysis of E-Learning Challenges and Innovations in Dental Education

Country	E-learning Adoption	Reported Challenges
Germany	80%	Faculty resistance, need for rapid digital upskilling.
Turkey	45%	Technological barriers, resource shortages, and heightened stress.
USA	65%	Limited hands-on training and increased stress.
UK	70%	Reduced student engagement and reliance on hybrid models.
China	90%	Infrastructure gaps in rural areas, but strong government support.

Objective and Method

The objective of this study is to evaluate the perceptions of e-learning among dental students during the COVID-19 pandemic and analyze its impact on the quality of dental education, particularly in theoretical learning, pre-clinical training, and clinical practice. Additionally, the study aims to identify regional disparities in e-learning adoption and propose innovative solutions, such as hybrid learning models and AR/VR technologies, to address these challenges.

To achieve this, a comprehensive literature review was conducted using predefined keywords, including "COVID-19," "dental education," "e-learning," and "clinical practice." Relevant articles were sourced from PubMed, Scopus, and Google Scholar, covering studies published between 2020 and 2024. The inclusion criteria consisted of peer-reviewed studies focusing on dental education during the COVID-19 pandemic, particularly those assessing e-learning challenges, adoption rates, and proposed solutions. Only original research, cross-sectional studies, and systematic reviews were considered. Non-peer-reviewed studies, opinion pieces, and articles unrelated to dental education or lacking clear methodological descriptions were excluded.

From an initial pool of 450 studies, a total of 34 articles met the inclusion criteria and were selected for detailed analysis. The findings were synthesized and categorized into four main themes: regional disparities in e-learning adoption, challenges in practical training and clinical skill acquisition, psychological impacts on students, and innovative solutions for improving dental education. Results were summarized in structured tables and critically discussed in relation to existing literature to highlight key insights and future directions.

Results

The studies reviewed underscore the growing need to integrate digital tools, including internet-based platforms and e-learning technologies, into dental curricula to ensure continuity of education and support learning outcomes[5]. While students demonstrated adaptability to these platforms, challenges persisted, particularly in pre-clinical and clinical training, where hands-on skill development was disrupted. Several studies reported that although e-learning was effective for theoretical knowledge, it failed to provide adequate support for acquiring procedural and psychomotor skills. Psychological challenges were also prominent, as students experienced increased stress, anxiety, and fatigue, which impaired their ability to concentrate and retain information effectively[6,7].

A comparative analysis of e-learning adoption rates and challenges across key regions is summarized in Table 1.

The findings emphasize the significant regional disparities in e-learning adoption and reported challenges. Germany and China achieved the highest adoption rates, attributed to their robust digital infrastructure, institutional preparedness, and use of innovative tools like AR/VR for clinical simulations[8]. In contrast, Turkey and the USA faced notable difficulties, including technological limitations, lack of practical training, and increased psychological burden on students[9,10].

Several solutions have been proposed to mitigate these challenges. Virtual simulations have emerged as a useful tool for pro-viding clinical practice in a controlled environment, while hybrid learning models strategically combine online theoretical education with in-person practical sessions. Tele-dentistry tools have also offered remote clinical consultations and instructor feedback, enhancing students' learning experience. However, despite their promise, these approaches remain insufficient to fully replicate real-world patient care, underscoring the need for further refinement and investment in technological tools.[11]

Discussion

The review found that while theoretical education successfully adapted to e-learning during the COVID-19 pandemic, practical training faced significant challenges due to the limitations of replicating hands-on clinical experiences online. Dentistry education, unlike other professional programs, relies heavily on an integrated structure of theoretical teaching, pre-clinical laboratory practices, and clinical training, which are not easily replicated in virtual settings. This unique structure limited the widespread adoption of distance learning strategies, despite its advantages in ensuring educational continuity during the pandemic[6,8].

Countries such as Germany and China achieved higher adoption rates (80% and 90%, respectively) due to their robust digital infrastructure, faculty upskilling, and advanced technological integration. Germany focused on preparing educators for digital teaching, ensuring smoother transitions to online platforms. Similarly, China implemented government-supported programs and incorporated AR/VR technologies to simulate clinical environments, partially mitigating the lack of hands-on training opportunities[8].

Psychological challenges were a recurring theme across regions, with many students reporting fatigue, reduced concentration, and difficulties in retaining material during online education[12]. These findings emphasize the importance of addressing mental health support alongside educational reforms to ensure student well-being and engagement.

Innovative strategies, such as hybrid learning models and AR/VR simulation tools, have shown promise in bridging these gaps. Hybrid models combine online theoretical education with controlled, in-person practical training sessions, addressing some of the limitations of distance learning[8]. Similarly, AR/VR technologies enable students to practice procedures in simulated environments, improving skill retention and reducing the psychological burden associated with physical practice during the pandemic. However, these tools cannot fully replicate real-world patient care, emphasizing the need for further refinement and resource allocation.[13]

Moving forward, addressing regional disparities in e-learning adoption requires targeted investments in digital infrastructure, particularly in resource-limited regions like Turkey. Furthermore, global collaboration among institutions can facilitate knowledge-sharing and access to innovative educational tools, ensuring a more equitable and resilient dental education system worldwide. Future research should prioritize longitudinal studies to evaluate the effectiveness of hybrid learning models and AR/VR technologies in enhancing clinical competency and student readiness for professional practice.

Conclusion

E-learning has proven to be an essential tool in dental education during the COVID-19 pandemic, ensuring flexibility and accessibility for theoretical learning. However, its limitations in delivering practical, pre-clinical, and clinical training emphasize the need for a hybrid approach that combines digital teaching with structured, hands-on sessions to bridge gaps in skill acquisition.

Author Contributions

Detailed literature review and compilation : G.H.
Manuscript preparation and editing : All Authors

Conflict of Interest

There is no conflict of interest.

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Authors' ORCID(s)

G.H.   0009-0005-1345-9755
C.E.   0000-0003-4391-2408

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CONGRESS PROCEEDING

New Radiological Approaches in Dental Education

İrem Öztürk [1,*] and Kaan Orhan [1,2,3]

[1]1Department of Dentomaxillofacial Radiology, Faculty of Dentistry, Ankara University, Ankara, Turkey and
[2]2Department of Dental and Maxillofacial Radiodiagnostics, Medical University of Lublin, Lublin, Poland and
[3]3Ankara University Medical Design Application and Research Center (MEDITAM), Ankara, Turkey

*Corresponding Author; iremozturk96@hotmail.com

Abstract

Purpose: Today, dentistry education is undergoing constant renewal, driven by the rapid advancements in technology. Among the most significant of these innovations are the remarkable strides in radiological imaging techniques, which have fundamentally transformed the way dental professionals are trained and practice their skills. The integration of cutting-edge technologies such as digital radiography, 3D imaging, and artificial intelligence (AI)-assisted diagnostic tools has opened new frontiers in dental education, offering enhanced visualization, precision, and diagnostic capabilities. These advancements not only provide students with a deeper understanding of oral structures and pathology but also equip them with practical experience that mirrors real-world clinical scenarios. This review aims to comprehensively evaluate the incorporation of these novel radiological approaches into dentistry education and analyze their effects on student learning outcomes, diagnostic accuracy, and clinical efficiency. Additionally, it seeks to explore the broader implications of these technologies in shaping the future of dental practice and improving patient care.

These technologies aim to address critical gaps in traditional dental education, such as limited diagnostic precision, insufficient exposure to complex clinical cases, and the lack of hands-on experience with advanced imaging tools, thereby enhancing both the quality and relevance of student training.

Objective and Method: : The purpose of this review is to discuss current studies on how new radiologic approaches in dentistry, especially artificial intelligence and its products, can provide differences and advantages in the field of education and it is a general literature review.. It is also aimed to give ideas about future studies and developments. It is to present a brief summary of recent studies on this subject. For this purpose, keywords such as dentistry education, ai, training, undergraduate students, new approaches , radiology, technology ,cbct, vr,ar were written to Pubmed. Original research and systematic reviews were included. We used various combinations of keywords. We obtained titles from the studies that emerged as a result of these combinations. In total, we obtained 380 articles with different combinations of 2 and 3 words. We removed the ones that were not directly related to radiology, those that were not in English, and those that were published before the last 6 years. In total, we were left with 34 different publications.

Results: We can address new radiological approaches under 5 basic headings. Digital Imaging, Three-Dimensional Imaging (CBCT - Cone Beam Computed Tomography), Artificial Intelligence-Assisted Image Processing, Digital Implant Planning and Augmented Reality (AR) and Virtual Reality (VR).

Key words: ai, ar, cbct, dentistry education, radiology, technology, vr

Introduction

Digital imaging is the process of recording and processing objects or scenes in digital format. This technology is often used in medical, industrial and scientific fields. For example, in dentistry, digital imaging allows high-resolution images of teeth and oral structures to be obtained with tools such as intraoral scanners and digital X-rays. This allows more accurate diagnoses to be made and treatment planning to be carried out more effectively.[1]

Digital imaging offers significant advantages in modern dentistry. For instance, digital radiography can reduce radiation doses by 50-80% compared to traditional film methods, minimizing patients' exposure to radiation . Additionally, digital images can be viewed instantly, significantly reducing patients' waiting times . By eliminating the need for chemical processing and darkroom requirements, it makes the imaging process more reliable.[2] Digital images also allow for easy adjustments to features like contrast and sharpness, enabling clearer images without additional radiation ex-

posure.[2] Finally, the ability to store and share digital images easily in a computer environment greatly facilitates access and management.[3] For these reasons, digital imaging has become a preferred method in dentistry.

The advantages of Cone Beam Computed Tomography (CBCT) include: Enhanced Visualization: CBCT provides high-resolution 3D images that allow for detailed anatomical analysis, which is particularly beneficial in dental and maxillofacial applications.[4]Reduced Radiation Exposure: Compared to traditional CT scans, CBCT typically exposes patients to lower doses of radiation, making it a safer option for imaging.[5] Multiplanar Reconstruction: CBCT allows for the reconstruction of images in multiple planes (axial, coronal, and sagittal), facilitating comprehensive evaluation of complex anatomical structures . Improved Diagnosis: The detailed imaging capabilities of CBCT enhance the accuracy of diagnoses, particularly in identifying conditions such as impacted teeth, root canal issues, and airway analysis.[6] Integration in Education: CBCT technology is increasingly being integrated into dental education, providing students with advanced tools for learning and understanding anatomical details .Legal and Forensic Applications: CBCT is also utilized in legal and forensic medicine for its effective analysis of anatomical details, which can be crucial in various investigations .These advantages highlight the growing importance of CBCT in both clinical practice and educational settings.[7]

Despite the significant potential, AI solutions have not yet become widely integrated into routine medical practice. In dentistry, for instance, convolutional neural networks have primarily been employed in research environments since 2015, mostly focusing on dental radiographs. Only recently have these technologies begun to be applied in clinical settings.[8] This is especially surprising given that dentistry is particularly well-suited for AI applications: 1) Imagery is fundamental to dentistry, playing a crucial role throughout the patient's dental journey, from initial screening to treatment planning and execution. 2) Dentistry frequently involves using different imaging modalities from the same anatomical region of the same patient, often supplemented by non-imaging data like clinical records, medical and dental histories, systemic health conditions, and medications. Additionally, data are often collected over multiple time points. AI has the capacity to integrate and analyze these diverse data sets, enhancing diagnosis, prediction, and clinical decision-making. 3) Many dental conditions, such as caries, apical lesions, and periodontal bone loss, are relatively common. Therefore, building large datasets with numerous "affected" cases can be accomplished without excessive difficulty. We identify three main factors that explain why dentistry has not fully embraced AI technologies. Addressing these issues will help to improve dental AI technologies and promote their adoption in clinical practice.

AI offers several benefits for dental education, significantly enhancing both the learning experience and student outcomes. One of the key advantages is personalized learning, where AI can tailor educational materials to meet the specific needs of individual students, thereby improving their understanding and retention of complex concepts.[9] Additionally, interactive simulations powered by AI, such as virtual reality (VR) simulations, allow students to practice procedures in a risk-free environment. This not only boosts their practical skills but also enhances their confidence in performing real-world tasks.[9] Another important application is automated feedback, as AI systems can provide immediate and constructive feedback on student performance, helping students pinpoint areas for improvement and fostering self-directed learning. Furthermore, AI tools can enhance communication between educators and students, ensuring that information is conveyed clearly and effectively, thus reducing misunderstandings and facilitating better learning outcomes. Lastly, AI can assist in data analysis for curriculum improvement, by examining student performance data to identify trends and gaps in knowledge. This valuable insight allows educators to refine curricula and teaching methods, ensuring that the learning experience is continually evolving to meet the

needs of students.[9] Overall, these applications aim to create a more effective and engaging learning environment, ultimately leading to better-prepared dental professionals.

Digital Implant Planning The widespread integration of digital technology into oral implantology has significantly facilitated implant surgery and prosthetic treatments.[10] Digital technology plays a crucial role throughout the implant process, including data collection, virtual patient creation through information integration, the execution of surgical procedures, and subsequent implant restorations. A comprehensive review of developments in digital technology within implantology has found that it is continually updated and renewed based on previous methods or the creation of new digital techniques.[11]

Digital implant planning holds an important place in dental education, offering several advantages for teaching students modern dental practices. One of the key benefits is the use of advanced learning tools, as digital technologies provide tools such as 3D modeling and simulations. These tools help students better understand the implant placement process, allowing theoretical knowledge to be reinforced with practical applications.[12]

Moreover, digital implant planning teaches students how to plan the implant placement process with greater precision, which contributes to the development of their clinical skills. Additionally, digital workflows help students manage treatment processes more quickly and efficiently, enhancing their clinical experience and increasing patient acceptance rates.[12]

Another significant advantage is that digital implant planning provides students with knowledge about cost-effectiveness and resource management, helping them make more informed decisions in their future practices.[12] For these reasons, digital implant planning is considered an essential component of dental education.

Augmented Reality (AR) can be defined as a technological tool and offers the user an experience in a physical environment. This experience usually occurs through electronic devices such as mobile phones or tablets. AR offers different solutions by being used in various fields such as gaming, education, architecture, design, and health. Especially in education, it is possible to develop traditional narrative models with AR and to offer students visually and auditorily rich applications. Virtual Reality (VR) technology offers the user a virtual universe experience and is usually experienced using VR glasses. This new form of reality is associated with a concept called "Metaverse" and its use is foreseen to increase in the future. The user is in a three-dimensional world thanks to VR glasses. This new perception of reality has inspired various research areas and VR has begun to be used effectively in many sectors. In 2004, Le Blanc et al. conducted a study with second-year dentistry students at Columbia University, and provided one group with 110 hours of traditional preclinical laboratory training, while another group received 6-10 hours of simulation clinic training in addition to this training. In the evaluations made at the end of the year, it was observed that the students who received simulation training achieved higher grades.[13]

Conclusion

Many new approaches are being utilized today. In a changing world, it is necessary and inevitable to be open to new developments in education and to benefit from advancements in technology and software alongside traditional materials in radiology education. In light of the studies conducted, there is a growing need for more research and progress in this field in the near future, requiring a greater number and variety of studies. For instance, controlled studies could be conducted to better evaluate the educational effectiveness of these technologies, or studies directly comparing existing approaches could be included. Additionally, this study is merely a general literature review. An increasing number of studies are being published on the subheadings discussed here, and based

on these current studies, it is recommended to identify specific topics and conduct more detailed reviews at the systematic review level.

Author Contributions

Conflict of Interest

There is no conflict of interest.

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Authors' ORCID(s)

I.O.   0000-0002-6496-6977
K.O.   0000-0001-6768-0176

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CONGRESS PROCEEDING

Dental Education Digitization: Virtual Reality (Vr) And Augmented Reality (Ar)

Merve Önder [1,*] and Kaan Orhan [1,2,3]

[1]Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Ankara University, Ankara, Turkey and
[2]Department of Dental and Maxillofacial Radiodiagnostics, Medical University of Lublin, Lublin, Poland and
[3]Ankara University Medical Design Application and Research Center (MEDITAM), Ankara, Turkey

*Corresponding Author; merveonder_16@hotmail.com

Abstract

In dental education, the role of practical training is crucial. Dental students undergo numerous practical training sessions during the first three years to enhance their manual and visual skills. Technological advancements have found their place in the field of dentistry, as in every other area. Three-dimensional (3D) imaging and printing, computer-aided design and computer-aided manufacturing (CAD/CAM), artificial intelligence (AI), virtual reality (VR), and augmented reality (AR) based applications are building a significant presence in both dental education and practice.

Objective and Method: Our aim in this review is to investigate the impact and significance of VR and AR in dental education. Therefore, a comprehensive literature review was conducted on the subject, and the results were evaluated and summarized.

Results and Conclusions: One of the most significant advantages of AR and VR systems is their ability to facilitate manual skill acquisition and minimize errors with instant feedback. The major distinguishing feature of AR systems from VR systems in education is the absence of disconnection from reality in the former case. AR gives students the feeling of being in a real environment and guides them during dental treatment. Although AR and VR applications seem easily integrable into dental education, further research is needed for these emerging digital technologies.

Key words: AR; Dentistry; Dentistry education; Digitalization; Digitalization in dentistry; VR

Introduction

In dental education, practical training plays a crucial role. Dental students participate in numerous practical trainings during their first three years to improve their manual and visual skills. The aim of these practical trainings is to prepare students for patient care by equipping them to perform endodontic, restorative, and prosthetic procedures through simulation-based training in laboratory settings.[1−3]

Technological advancements have made their mark in the field of dentistry, as they have in many other areas. Three-dimensional (3D) imaging and printing, computer-aided design and computer-aided manufacturing (CAD/CAM), artificial intelligence (AI), virtual reality (VR), and augmented reality (AR) applications are increasingly prominent in both dental education and practice. VR is a technology that immerses individuals in a simulated 3D environment that mimics real-world properties through head-mounted displays, engaging their senses of sight, hearing, and motion. AR, on the other hand, enables users to overlay virtual objects onto physical objects, allowing interaction with both simultaneously.[2,4]

Methods

Our aim in this review is to investigate the impact and significance of VR and AR in dental education. Additionally, it aims to explore in which areas of dental education the current practical training using VR and AR can be applied, and whether these innovative training methods can replace traditional practical treatments. Therefore the results were evaluated and summarized.

Results

One of the key advantages of AR and VR systems is their ability to facilitate the acquisition of manual skills while minimizing errors through instant feedback. A major distinguishing feature of AR systems, compared to VR systems in education, is that AR does not disconnect users from reality. AR provides students with the sensation of being in a real environment and offers guidance during dental procedures.[5−10]

Discussion

Studies have been conducted on many subjects in VR and AR supported education. The main ones included anatomy and radiology training, tooth preparation techniques, practical motor skills training, surgical training, and 3D vision training. [5−11]

In a study by Al-Saud et al. evaluating students' motor skill acquisition using a haptic dental simulator with 63 participants, the students were divided into three groups. Group 1 received only device feedback during the training phase, meaning they used the simulator's visual display. Group 2 received verbal feedback from a qualified dental instructor. Group 3 benefited from both instructor and device feedback. The comparisons showed that Group 3 was the most successful. This highlighted that combined training, which includes both instructor guidance and simulator feedback, is the most effective type of training. [5] In a study by Suebnukarn et al. evaluating the validation of a VR dental simulator for motor skills training, the findings revealed that the VR simulator was capable of distinguishing between the performances of experts and non-experts. [10] De Boer et al. examined the differences in students' performance and appreciation in a virtual learning environment. The study found that 3D vision in a virtual learning scenario had a significantly positive effect on both students' performance and their overall appreciation of the environment, compared to 2D vision. [7] Correa et al. examined the accuracy of a dental anesthesia training simulator for the inferior alveolar nerve block. The simulation was tested to be highly suitable in terms of the proper localization of the needle, insertion depth, and the sensitivity of the virtual tissue resistance. [6] Similarly, in comparable studies conducted by Samuel et al. and Lamira et al., it was highlighted that dental students who used virtual environments for practicing inferior alveolar nerve block were more confident when performing their first clinical injections compared to those exposed only to traditional supplementary materials. These students required fewer syringe readjustments and were more successful in anesthetizing patients. This indicates that virtual environment training can be beneficial in surgical practical education and can be integrated into training programs. [12,13]

In a study by Eve et al., which compared the caries removal performance of dental students and experienced prosthodontics specialty students using a haptic simulator, it was found that the average performance of novice and experienced participants differed significantly in terms of the percentage of carious lesion removed and the volume of sound tooth structure removed during the caries removal exercise. Experienced dentists were found to be more successful in the virtual environment. This result suggests that a hybrid training approach, which includes both traditional practical training and VR/AR-supported education, may lead to higher success rates in dental education, rather than relying solely on VR/AR-based training. [9]

As highlighted in the articles mentioned, this review focuses on the latest research in VR/AR technologies, which represent current advancements in dental education. It has been observed that AR/VR systems offer valuable educational opportunities for both undergraduate and dental specialty students. Given that clinical dental education relies heavily on serious and continuous practice for motor skill acquisition, AR/VR is generally seen as having a positive impact on the quality of the learning process. [5−11] However, several uncertainties currently limit the widespread application of AR/VR technologies in clinical practice. Effective management of existing data, data anonymization, proper security protocols, and the development of new algorithms for the statistical analysis and interpretation of generated data are essential measures to address these limitations. [3,6,8,11]

Conclusion

AR and VR systems are ideal for dental education due to they facilitate manual skill acquisition and minimize errors through real-time feedback. Although AR and VR applications seem easily integrable into dental education, further research is needed for these emerging digital technologies. Additionally, some changes in the curriculum are needed to integrate current dental practical training with VR/AR-supported education. [6,8,11,14] In light of these studies, it is believed that in the future, VR and AR training and courses could be expanded to all branches of dentistry. Through VR/AR-based education, students could become more successful and confident in areas such as surgery, radiology, restorative dentistry, and prosthetics. However, further research is needed.

Author Contributions

Detailed literature review and compilation : M.O.
Manuscript preparation and editing : All authors

Conflict of Interest

There is no conflict of interest.

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Authors' ORCID(s)

M.O.   0000-0002-3476-1727
K.O.   0000-0001-6768-0176

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CONGRESS PROCEEDING

A Cross-Sectional Study On The Readiness Of Dentistry Specialty Students In The Role Of Associate Educator

Işıl Sarıkaya [1,*], Alem Coşgun [2] and Hüseyin Hatırlı [3]

[1]Tokat Gaziosmanpaşa University Faculty of Dentistry, Department of Prosthodontics and [2]Tokat Gaziosmanpaşa University Faculty of Dentistry, Department of Pediatric Dentistry and [3]Tokat Gaziosmanpaşa University Faculty of Dentistry, Department of Restorative Dentistry

*Corresponding Author; sarikayaisil@gmail.com

Abstract

Purpose: Our study aims to contribute to the literature by self-evaluating Dentists who graduated from different universities in our country, in the departments where they currently receive specialization training on Communication, Adaptation Skills, Information Management, Thinking and Problem Solving, and Professionalism.

Materials and Methods: : Research assistants who received specialist training in 8 departments of Tokat Gaziosmanpaşa University Faculty of Dentistry and who had not completed the first year of their education were included in the study. Participants were asked to participate in a ten-question survey on an entirely voluntary basis. When comparing the means of quantitative variables between groups, the Significance of the Difference Between Two Means test was used. Cross-tabulations and chi-square tests were used to evaluate whether there was a relationship between qualitative variables. p values were considered statistically significant when calculated to be less than 0.05.

Results: According to the results obtained from our study, 78% of the speciality students reported that they thought that the clinical practice training they received during their student years was sufficient to educate clinical students, and 87.8% reported that they did not have communication problems with clinical practice students. While the answer to the question "The treatment planning I make in my clinical practice is compatible with the faculty member's planning" was 95.1% agree, 51.2% of the participants answered that they agreed with the question "I feel competent enough to solve any problem I encounter in clinical practice on my own."

Conclusions: All participants are eager to learn different treatment methods related to the cases they encounter in clinical practice. Likewise, the vast majority reported that they were willing to develop new tools and techniques for use in clinical practice. This situation is promising for the future of our profession.

Key words: Dental Specialty Student; Dentistry Clinical Practice Training; Teamwork

Introduction

Clinical practice education at the undergraduate level in Dentistry cannot be limited to the faculty member's efforts to educate his students, as in the traditional model. It is a complex and demanding training in which, in addition to many environmental factors, assistant trainers also take an active role. Assistant physicians are considered the workforce in the role of assistant educators in clinical processes.[1] In this context, while providing service as a team member, producing and managing scenarios when necessary in the clinic, and being able to communicate healthily, Those who learn and teach should have the mission of health protection.[2] Instructors' mastery of their subject plays a significant role in correcting students' mistakes. Survey-based studies involving the attitudes of assistant physicians in the clinical environment are available both in the Faculty of Medicine and in the field of Dentistry.[3−5]

Evidence-based work for graduate dentists will only be possible if they are employed based on evidence during their clinical practices during undergraduate education.[6,7] At the same time, teaching activities continue outside the clinic. Instructors produce knowledge and supervise and support students so they can develop their competencies. In addition, instructors must be continuously educated and continue their professional development.[8]

Self-assessment can be defined as students' evaluation of the progress of their learning activities and their attitudes and abilities against accepted standards.[9] Self-evaluation of the person enables safe and effective clinical practice. It is an effective learning tool and can support lifelong learning.

Table 1. Distribution of qualitative variables

	Questions	Agree n(%)	Disagree n(%)
Q1	I think that the clinical practice training I received is sufficient to train clinical students.	32(78)	9(22)
Q2	I feel competent enough to solve any problem I encounter in clinical practice on my own.	21(51,2)	20(48,8)
Q3	I do not have communication problems with clinical students.	36(87,8)	5(12,2)
Q4	I think I make evidence-based clinical practices in my clinical practice.	35(85,4)	6(14,6)
Q5	The treatment planning I make in clinical practice is compatible with the planning of the faculty member.	39(95,1)	2(4,9)
Q6	In my clinical practice, I do not have difficulty working with other physicians in cases that require multidisciplinary treatment.	36(87,8)	5(12,2)
Q7	I do literature research on the cases I encounter in clinical practice.	34(82,9)	7(17,1)
Q8	I am willing to learn different treatment methods regarding the cases I encounter in clinical practice.	41(100)	0(0)
Q9	I am keen to develop new tools and techniques for use in clinical practice.	40(97,6)	1(2,4)
Q10	In clinical practice, the intensity of students or their attitudes and behaviours do not affect my professionalism.	23(56,1)	18(43,9)

The aim of our study is to contribute to the literature by self-evaluation of Dentists who graduated from different universities in our country, in the departments where they currently receive specialization training on Communication, Adaptation Skills, Information Management, Thinking and Problem Solving, and Professionalism.

Methods

The present study was carried out with the number of "24-KAEK-040" permission of the Clinical Research Ethics Committee of the Medical School of Tokat Gaziosmanpaşa University. For the sample size of our study, which investigates the readiness of specialist students in clinical practice training, it was determined that 40 specialization students should be included in the study with a single sample design of 80% power, 5% and an effect size of 0.2. G*Power 3.9.1.6 program was used for Sample Volume. Research assistants who received specialist training in 8 departments of Tokat Gaziosmanpaşa University Faculty of Dentistry and who had not completed their first year of education were included in the study on a voluntary basis. A 10-question survey was conducted with a total of 41 specialization students via Google Forms, including gender, field of specialization, faculty of graduation and graduation year. Descriptive analyses were conducted to provide information about the general characteristics of the study groups. Data for continuous variables are presented as mean ± standard deviation; Data regarding categorical variables are given as n (%). The Significance of the Difference Between Two Means test was used to compare the means of quantitative variables between groups. Cross-tabulations and chi-square tests were used to evaluate whether there was a relationship between qualitative variables. p values were considered statistically significant when calculated to be less than 0.05. Ready-made statistical software was used in the calculations (IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp).

Results

The distribution of qualitative variables according to survey responses is presented in Table 1.

When looking at the post-graduation working hours of specialty students, there was no significant difference between the answers given to all questions and the working time. The average working time of the participants after graduation was 2.24±1.8 years.

To question Q1, "I think the clinical practical training I received is sufficient to train intern students," 78% of the participants answered "I Agree", and 22% answered, "I Disagree." Q2: "I feel competent enough to solve any problem I encounter in clinical practice on my own" is the question with the highest rate of disagreeing answers. A statistically significant difference was detected between the answers to Q1 and Q2 (p = 0.006). To question Q4, "I think I use evidence-based practices in clinical practice," the answer was 85.4% Agree and 14.6% Disagree. A statistically significant difference was found between the answers to Q1 and Q4 (p = 0.004).

A statistically significant difference was found between male and female participants in the answers to the question Q3 "I do not have communication problems with clinical students" (p<0.001) (Table 2).

To question Q6 "I do not have difficulty working with other physicians in cases requiring multidisciplinary treatment in clinical practice", 87.8% answered "Agree" and 12.2% answered "I Disagree".

Discussion

While 78% of the participants said "I agree" to the question "I think the clinical practical training I received is sufficient to educate clinical students", 48.8% answered "I disagree" to the question "I feel competent enough to solve any problem I encounter in clinical practice on my own." The answer to the "I think I use evidence-based practices in clinical practice" was 85.4% Agree and 14.6% Disagree. It was understood that specialty students think transferring the clinical skills they gained during their student years to student education is acceptable. However, they feel they need to be more competent to solve problems independently due to a problem that may occur in the clinical environment. One reason for this is that the cases given to clinical students are chosen from cases that can be easily studied. However, when they encounter more complex cases, such as on clinical duty by himself/herself, they feel inadequate themselves.

As a result, the specialty students felt they needed to have the students do similar work they had done in the clinical environment. However, they need to determine whether their treatments are evidence-based. They reported that 17% of them needed to conduct literature research on the cases they encountered in the clinic. However, 97.6% reported they were willing to develop new tools and techniques for clinical practice. All participants are willing to learn different treatment methods regarding the cases I encounter in clinical practice. In other words, there is a tendency to obtain information readily available. However, students specializing in

Table 2. Distribution of variables by gender

		Gender			p
		Total n(%)	Female n(%)	Male n(%)	
Q1	Agree	32(78)	21(77,8)	11(78,6)	0,954
	Disagree	9(22)	6(22,2)	3(21,4)	
Q2	Agree	21(51,2)	11(40,7)	10(71,4)	0,062
	Disagree	20(48,8)	16(59,3)	4(28,6)	
Q3	Agree	36(87,8)	27(100)a	9(64,3)b	<0,001
	Disagree	5(12,2)	0(0)	5(35,7)	
Q4	Agree	35(85,4)	23(85,2)	12(85,7)	0,964
	Disagree	6(14,6)	4(14,8)	2(14,3)	
Q5	Agree	39(95,1)	25(92,6)	14(100)	0,296
	Disagree	2(4,9)	2(7,4)	0(0)	
Q6	Agree	36(87,8)	25(92,6)	11(78,6)	0,193
	Disagree	5(12,2)	2(7,4)	3(21,4)	
Q7	Agree	34(82,9)	24(88,9)	10(71,4)	0,159
	Disagree	7(17,1)	3(11,1)	4(28,6)	
Q8	Agree	41(100)	27(100)	14(100)	0,160
	Disagree	0(0)	0(0)	0(0)	
Q9	Agree	40(97,6)	27(100)	13(92,9)	0,219
	Disagree	1(2,4)	0(0)	1(7,1)	
Q10	Agree	23(56,1)	17(63)	6(42,9)	
	Disagree	18(43,9)	10(37)	8(57,1)	

Pearson chi-square test was used. (ab): The common letter as a row indicates statistical insignificance.

entrepreneurship should be encouraged and directed to do more research. The biggest obstacle to this is the limited period of expertise.

When students choose their specialization areas, their expectations of financial gain and the difference in effectiveness between departments are at the forefront.[10] In the study of Çulhaoğlu et al.,[4] Dentistry Specialty students were asked about their reasons for specialization, and it was reported that the priority was the desire to pursue an academic career and improve themselves. According to the results of our study, it is promising that there is a belief that the goal is not reached after gaining expertise and that there is a need to continue research and training to improve oneself. Career planning after specialization and creating motivation in this direction will enable specialization students to progress on the path that will lead to academic success.

When the answer to "I agree with the statement "The intensity or attitude and behaviour of students in clinical practice does not affect my professionalism" was examined by gender, a significant difference was found between men and women. This may be because women with a higher participation rate may be more tolerant in the clinical study environment. Otherwise, men may be weaker in terms of communication.

When the faculties from which the Specialty students participating in our study graduated were examined, the presence of graduates of the Faculty of Dentistry of 22 different universities ensured a homogeneous distribution of the participants. Thus, our study can be considered a cross-sectional study. In addition, as a limitation of our study, the small sample size of our sample group and the fact that the survey questions are summary and conducted online cause one to wonder whether sufficient time was spent or whether the questions were clearly understood.

Conclusion

Lifelong learning and rational knowledge management are essential for medical practice. Regarding clinical practice, specialist students participate in clinical processes as a part of the team for limited periods. Their adaptation skills, communication, decision-making processes, problem-solving skills, and professionalism will be developed during their years of expertise in the course. In order to follow this development more closely and spend it with

maximum efficiency, self-evaluation studies similar to our study should be conducted, and the results should be closely monitored. In addition, taking precautions such as arranging specialization course curricula, including up-to-date devices and techniques, and encouraging multidisciplinary studies will increase the quality of Specialization education in Dentistry.

Author Contributions

Concept : I.S.
Design : A.C.
Data Collection or Processing : All Authors
Analysis or Interpretation : A.C. , H.H.
Literature Search : All Authors
Writing : I.S.

Conflict of Interest

The authors declare that they have no conflict of interest.

Authors' ORCID(s)

I.S.   0000-0002-2172-4724
A.C.   0000-0001-6586-6700
H.H.   0000-0002-4451-7576

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CONGRESS PROCEEDING

Evaluation of Specialization Preferences of Faculty of Dentistry Students

Merve Gürses * , Atiye Tuğba Kuzgun Türkmen and Nimet Ünlü

Selçuk University, Dentistry Faculty, Restorative Dentistry Department, Alaeddin Keykubat Campus, Selçuklu/Konya/Turkey

*Corresponding Author; merve.gurses@selcuk.edu.tr

Abstract

Purpose: The aim of this study is to evaluate the post-graduation specialty education preferences of 3rd and 5th year dentistry students and the factors that motivate these preferences.

Materials and Methods: : This survey was applied to students of Selçuk University Faculty of Dentistry. A total of 207 students, 104 3rd grade and 103 5th grade students, participated in the study. Two different response types were used in the study: multiple choice and linear scale (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree). Considering the literature on this subject, an 8-question survey form was prepared. The form was uploaded to the Google Surveys (Google Workplace, Google, USA) page, and the relevant form was emailed to dentistry school students. The survey questions remained accessible between December 2023 and January 2024.

Results: While 3rd graders are mostly undecided about whether their undergraduate education should focus on DSE (48.1%), 5th graders think that undergraduate education (62.1%) is not aimed at DSE. In both grades, the rate of those who find it necessary to attend private teaching institutions is high. When choosing a department, 3rd-grade students (29.8%) mostly prefer Orthodontics; 5th graders (32%) chose Oral and Maxillofacial Surgery. While the 5th-grade students said they would prefer a faculty different from their own for specialization training, most 3rd-grade students were undecided. However, both grades stated that the department was more effective in determining their training specialty preferences than the city and university.

Conclusions: Most dentistry students believe that training in specialization areas is necessary. Nda Clinical internship training is an effective parameter in post-graduation career planning. Oral and Maxillofacial Surgery and Orthodontics were our study's most preferred specialization departments. For both 3rd—and 5th-grade students, the department was more effective than the city and university in determining their specialization training preferences.

Key words: Dentistry students' choice; specialization in dentistry; undergraduate education in dentistry

Introduction

An individual's career choice is an essential factor that affects the person's attitude, appearance, social relations, and future income level.[1] As in all professions, factors such as the country's level of development, socio-economic factors, and individual preferences influence the long-term career planning of health professionals. The literature reports that factors such as the desire to help people, flexible working conditions, and a comfortable working environment are effective in influencing people to choose dentistry as a career.[2,3] The first dentistry school in Turkey was officially established in 1933. The school of dentistry, affiliated with the faculty of Medicine when it was founded and offered a two-year education, was separated from the Faculty of Medicine in 1964. This school was transformed into the Istanbul University Faculty of Dentistry,

and the education period was determined as 5 years.[1,4]

Dentistry is a complex and comprehensive education that includes professional knowledge and clinical skills, values appropriate to the medical identity, and a master-apprentice relationship.[5] However, the knowledge and skills acquired during undergraduate education remain basic and are sometimes inadequate to provide diagnosis/treatment skills for advanced cases. Specialization training in dentistry plays a crucial role in meeting society's specific dental health needs when general dentistry education is inadequate. Specialization training in dentistry is an important training process for successfully managing clinical cases' diagnosis and treatment and ensuring patient satisfaction. It allows for specialization and further training in the care of specific patient groups.[4,6] In 2011, by the Ministry of Health and the Higher Education institution, eight different fields of study were determined as specialization branches

of dentistry: Oral, Dental and Maxillofacial Surgery, Oral, Dental and Maxillofacial Radiology, Pediatric Dentistry, Endodontics, Orthodontics, Periodontics, Prosthetic Dentistry, and Restorative Dentistry. [7,8]

Students who want to specialize must first pass a specific score in a foreign language exam. Students who pass the foreign language exam are eligible to take the dentistry specialization exam (DSE). According to the dentistry specialization regulation, DSE, a central exam based on competence and competition principles, consists of multiple-choice professional knowledge sections. According to the DSE results held in September and April, students who graduate from dentistry choose one of the eight principal departments of the dentistry faculties and start their specialization training. Specialization training lasts 3-4 years, depending on the department. [6,9]

As the number of dentistry faculties increases, the number of newly graduated dentists also increases. As a result, DSE's participation rate also increases yearly. Multiple choice exam requirements, increasing numbers of participants, and limited places for specialist training have made DSE highly competitive. As a result of this competitive environment, a new industry called "special courses for DSE" has emerged. Most students see special courses as a requirement for success in DSE. However, there needs to be more data on how dental students' career plans have changed, what factors motivate their career choices, and to what extent the education they receive in dental schools meets their needs. This study aimed to evaluate the post-graduation career preferences of 3rd and 5th-year students of Selçuk University Faculty of Dentistry, the specialization training preferences of students planning to take the DSE, and the factors that motivate these preferences.

Methods

The survey study was approved by the Faculty of Dentistry Ethics Committee, Selçuk University (approval no:2024/53).

A total of 207 students, 104 of whom were in their 3rd year and 103 of whom were in their 5th year at Selçuk University, Faculty of Dentistry in 2023-2024, participated in this survey study. Two different response types were used in the study: multiple choice and linear scale (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree). Considering the literature on this subject, an 8-question survey form was prepared. The form was uploaded to the Google Surveys (Google Workplace, Google, USA) page, and the relevant form was emailed to dentistry school students. The survey questions remained accessible between December 2023 and January 2024.

Only 3rd—and 5th-grade Selçuk University Faculty of Dentistry students were included in this survey study. Students who did not want to answer the survey questions were excluded from the study. Each student responded to only one survey form. The questions asked in the survey are shown in Tables 1 and 2.

Results

The responses and rates of 3rd and 5th-grade students to the survey questions prepared with a linear scale are shown in Tables 1 and 2. While 72.1% of 3rd-grade students are considering speciality education, 6.8% are not considering specialization. In addition, 21.2% of them stated that they were undecided. In 5th grade students, 62.1% are considering specialization, 9.7% are not considering specialization. 28.2% of them indicated that they were undecided. When these rates are taken into consideration, it can be said that the majority of students in both periods want to receive specialization training after graduation.

While the 3rd-grade students are mostly undecided about undergraduate education being DSE-oriented (48.1%), the 5th-grade students mostly think that undergraduate education is not DSE-oriented (62.1%).

The rate of those who find it necessary to go to private teaching institutions is high in both grades (grade 3: 59.6%; grade 5: 64.1%). The undecided rates are pretty close to each other (grade 3: 23.1%; grade 5: 22.3%).

In terms of department preference, while the 3rd-grade students mostly preferred Orthodontics with a rate of 29.8%, this was followed by Oral and Maxillofacial Surgery with 22.1%. In the 5th-grade students, Oral and Maxillofacial Surgery was the most preferred, with a rate of 32% (Table 3).

When asked whether they would prefer their faculty or another faculty for specialization training, the majority of the 3rd-grade students stated that they were undecided (47.1%-51%). In contrast, the 5th-grade students mainly said that they would prefer a faculty different from their own (55.3%-70.9%).

When we investigated to what extent the city, university, and departments affect the choice of specialization education, it was seen that the department was at the forefront in the choice of both 3rd-grade (%78.8) and 5th-grade (%80.6) students.

Discussion

This survey study aimed to evaluate the post-graduation career preferences of 3rd and 5th-year students of Selçuk University Faculty of Dentistry, the specialization training preferences of students planning to take the DSE, and the factors that motivate these preferences.

Today, in parallel with the increasing number of dentistry faculties, the number of newly graduated dentists is also increasing every year. Due to the rising student quotas in faculties that have been providing education and training for many years and the clinical order that is not fully established in many newly opened faculties, it is anticipated that the demand for specialization training will increase compared to previous years.

Dentists' social and professional expectations, higher income expectations, the ability to work more freely, motivation of career ambition, desire to help people more, and a particular interest in dentistry are important factors affecting career choices after graduation. [10–13] The literature includes various studies examining the necessity of specialization in dentistry. [3,4,14,15] In their research, Fidele et al. reported that 81% of dentists need specialization, while Puryer and Patel showed this rate to be 71%. [14,15] In our study, this rate was 72% in 3rd and 62% in 5th grades. While the study's 3rd-grade results parallel these studies, this rate was lower in the 5th grade. The high demand for specialization training in dentistry may be related to the perception that general dentistry's income and status are lower in society compared to specialty areas. [16] In addition, there may be different reasons for the desire for specialization education, which was observed at a lower rate in the 5th grade in our study. These reasons may include the long and challenging process of undergraduate education, the desire to achieve financial independence quickly, decreased motivation due to exam anxiety, and the fact that the department choice has not been made yet.

When the results of this survey research are examined, it is noteworthy that 5th-year students have a high rate of choosing faculty other than their own for their specialty training. This result can relate to the students receiving clinical internship training while answering the survey questions. Having their first positive/negative experiences with patients and clinical procedures in their faculty and their already intense and stressful internship periods may cause students to want to go somewhere different from their environment. Another reason for this result may be that they want to experience theoretical and practical training in other faculties.

One of the striking results of the study is the different department preferences of 3rd and 5th-grade students for their specialization training. 3rd grade students who did not receive clinical

Table 1. The responses and rates of 3rd-grade students to the survey questions prepared with a linear scale

QUESTIONS		EVALUATION				
		1 (Strongly Disagre)	2 (Disagree)	3 (Undecided)	4 (Agree)	5 (Strongly Agree)
1	I am thinking of specializing in Dentistry.	1 (%1)	6 (%5.8)	22 (%21.2)	47 (%45.2)	28 (%26.9)
2	The undergraduate education at the faculty is aimed at the specialization exam.	8 (%7.7)	29 (%27.9)	50 (%48.1)	17 (%16.8)	0 (%0)
3	I must go to a private teaching institution for the specialization exam.	5 (%4.8)	13 (%12.5)	24 (%23.1)	28 (%26.9)	34 (%32.7)
4	I am considering choosing my faculty for specialization training in Dentistry.	6 (%5.8)	15 (%14.4)	49 (%47.1)	28 (%26.9)	6 (%5.8)
5	I am considering choosing different faculties for specialization training in Dentistry.	1 (%1)	10 (%9.6)	53 (%51)	32 (%30.8)	8 (%7.7)
6	The university is at the forefront of my choice of specialization training in dentistry.	2 (%1.9)	20 (%19.2)	44 (%42.3)	30 (%28.8)	8 (%7.7)
7	The department is at the forefront of my choice of specialization training in dentistry.	1 (%1)	2 (%1.9)	19 (%18.3)	49 (%47.1)	33 (%31.7)
8	The city is at the forefront of my choice of specialization training in dentistry.	6 (%5.8)	18 (%17.3)	30 (%28.8)	38 (%36.5)	12 (%11.5)

Table 2. The responses and rates of 5th-grade students to the survey questions prepared with a linear scale

QUESTIONS		EVALUATION				
		1 (Strongly Disagre)	2 (Disagree)	3 (Undecided)	4 (Agree)	5 (Strongly Agree)
1	I am thinking of specializing in Dentistry.	3 (%2.9)	7 (%68)	29 (%28.2)	40 (%38.8)	24 (%23.1)
2	The undergraduate education at the faculty is aimed at the specialization exam.	27 (%26.2)	37 (%35.9)	30 (%29.1)	8 (%7.8)	1 (%1)
3	I must go to a private teaching institution for the specialization exam.	4 (%3.9)	10 (%9.7)	23 (%22.3)	36 (%35)	30 (%29.1)
4	I am considering choosing my faculty for specialization training in Dentistry.	23 (%22.3)	34 (%33)	26 (%25.2)	17 (%16.5)	3 (%2.9)
5	I am considering choosing different faculties for specialization training in Dentistry.	3 (%2.9)	7 (%6.8)	20 (%19.4)	48 (%46.6)	25 (%24.3)
6	The university is at the forefront of my choice of specialization training in dentistry.	2 (%1.9)	13 (%12.6)	31 (%30.1)	38 (%36.9)	19 (%18.4)
7	The department is at the forefront of my choice of specialization training in dentistry.	1 (%1)	3 (%2.9)	16 (%15.5)	45 (%43.7)	38 (%36.9)
8	The city is at the forefront of my choice of specialization training in dentistry.	5 (%4.9)	25 (%24.3)	32 (%31.1)	28 (%27.2)	13 (%12.6)

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Table 3. Departments and rates preferred by 3rd and 5th-grade students in specialization training

DEPARTMENTS	EVALUATION	
	3rd Grade	5th Grade
Oral, Dental and Maxillofacial Radiology	% 1.9	% 3.9
Oral, Dental and Maxillofacial Surgery	% 22.1	%32
Orthodontics	% 29.8	%14.6
Pedodontics	%5.3	%8.7
Periodontology	%14.4	%16.5
Endodontics	% 5.3	% 5.8
Restorative Dentistry	%8.7	%3.9
Prosthetic Dentistry	% 12.5	% 14.6

internship training preferred the Orthodontics Department to a great extent. In contrast, term five students who received clinical internship training in all departments preferred the Oral and Maxillofacial Surgery Department to a high extent. When we look at this result, clinical internship training is a very decisive factor in post-graduation career planning. In their study, Dere et al. reported that the most preferred specialization field was the Department of Oral and Maxillofacial Surgery, followed by the Department of Orthodontics.[4] These are the two most preferred specialization departments in our study, too. Two departments are preferred more because methods requiring advanced training, such as fixed orthodontic treatment and orthognathic surgical treatment, which are not included in undergraduate education, are included in postgraduate practical training; the prestige of the preferred specialization, its financial return and access to continuous professional development, and meeting aesthetic expectations.[6]

When asked which of the city, university, and department criteria is more effective in their choice of specialization education, students from both grades reported that the department is more important. Although all dentists have equal authority after undergraduate education, specialized doctors prefer to do more specific work. Considering this situation, it is quite understandable that students give more importance to their department choices when planning their academic and clinical careers.

Researching how dentistry students' career plans change and what factors motivate their career choices is an essential study area for undergraduate and graduate dentistry education. Given this information, we believe the study's results will broaden the perspective. However, there are some limitations to this survey study: The study was conducted only on 3rd and 5th-year students of Selçuk University Faculty of Dentistry. However, some of the 3rd and 5th-grade students studying at the faculty did not answer the survey questions. In addition, we believe that conducting the same survey study in faculties in different regions and cities of the country will improve the results of the research and provide a more comprehensive perspective.

Conclusion

Most dentistry students believe that training in specialization areas is necessary. Clinical internship training is an effective parameter in post-graduation career planning. Oral and Maxillofacial Surgery and Orthodontics were our study's most preferred specialization departments. For both 3rd—and 5th-grade students, the department was more effective than the city and university in determining their specialization training preferences.

Author Contributions

Conceptualization : All Authors
Methodology : All Authors
Investigation : All Authors

Data Curation : All Authors
Writing Original Draft : All Authors
Review/Editing : All Authors

Conflict of Interest

The authors declare that they have no conflict of interest.

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Authors' ORCID(s)

M.G.   0000-0002-9161-9524
A.T.K.T. 0009-0003-2184-4173
N.U.   0000-0002-6546-6368

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