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Bibliometric Analysis of In-vitro Studies on 'Orthodontics' and 'Aesthetic and Conservative Treatment' in the TR Index Journals

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Research Article

History

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ABSTRACT

Introduction: The aim of this study is to evaluate *in-vitro* titled studies in the field of orthodontics and aesthetic and conservative treatment published in TR Index journals.

Materials and Methods: A systematic search of the TR Index database (https://trdizin.gov.tr/) was conducted, focusing on studies that utilized the keyword "*in-vitro*". Inclusion criteria were limited to dental journal publications in English, Turkish, and other languages within the specified period. Data extraction and analysis included journal name, publication year, author institutions, departments, article type, article language, and citation count.

Results: A total of 140 *in-vitro* titled studies were identified across various dental specialties. After excluding 83 studies that did not align with the scope of 'orthodontics' and 'aesthetic and conservative treatment', 57 studies were included in the final analysis. Of these, 9 studies were related to 'orthodontics', and 48 studies focused on 'aesthetic and conservative treatment'. The journals with the highest number of *in-vitro* titled studies over the past three years were Turkiye Clinics Journal of Dental Sciences (13 studies), Cumhuriyet Dental Journal (8 studies), and Selcuk Dental Journal (8 studies). The language of publications, whether Turkish or English, did not significantly impact citation counts (p = 0.562).

Conclusions: *In-vitro* research have a significant for providing critical insights into materials and treatments in both 'orthodontics' and 'aesthetic and conservative treatment'. However, there is a need to increase orthodontic-related *in-vitro* studies. The findings suggest that the language of publication does not impact citation rates, indicating a broad acceptance of research across different languages.

Keywords: Bibliographic Databases, Bibliometric Analysis, Dental Aesthetic, In Vitro Techniques, Orthodontics.

TR Dizin Dergilerinde 'Ortodonti' ve 'Estetik ve Konservatif Tedavi' Alanlarındaki *İn-Vitro* Çalışmaların Bibliyometrik Analizi

Research Article

Süreç

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ÖZ

Amaç: Bu çalışmanın amacı, TR Dizin dergilerinde yayımlanan 'ortodonti' ve 'estetik ve konservatif tedavi' alanındaki *in-vitro* başlıklı çalışmaları değerlendirmektir.

Gereç ve Yöntemler: Bu çalışmada; ulusal veri tabanı olan TR Dizin'de (https://trdizin.gov.tr/) sistematik bir arama yapılmış ve "*in-vitro*" anahtar kelimesini kullanan çalışmalar incelenmiştir. Dahil edilme kriterleri, 2021-2023 yılları arasında İngilizce, Türkçe ve diğer dillerde yayımlanan diş hekimliği dergisi yayınları ile sınırlandırılmıştır. Yayınlar dergi adı, yayın yılı, yazar kurumları, bölümleri, makale türü, makale dili ve atıf sayısına göre sınıflandırılmıştır.

Bulgular: Diş hekimliği uzmanlık alanlarında yapılan incelemelerde toplam 140 *in-vitro* başlıklı çalışma tespit edilmiştir. "Ortodonti" ve "estetik ve konservatif tedavi" alanlarına dahil olmayan 83 çalışma analiz dışında bırakılmış ve nihai değerlendirmeye 57 çalışma dahil edilmiştir. Bu çalışmaların 9'u "ortodonti" alanında bulunurken, 48'i "estetik ve konservatif tedavi" alanında yer almaktadır. Son üç yılda en fazla *in-vitro* çalışmaya yer veren dergiler, 13 çalışma ile Türkiye Klinikleri Diş Hekimliği Bilimleri Dergisi, 8'er çalışma ile Cumhuriyet Üniversitesi Diş Hekimliği Fakültesi Dergisi ve Selçuk Üniversitesi Diş Hekimliği Fakültesi Dergisi olmuştur. Ayrıca, makalelerin Türkçe veya İngilizce dilinde yayımlanmasının atıf sayıları üzerinde istatistiksel olarak anlamlı bir etkisi bulunmamıştır (p = 0.562).

Sonuçlar: *In-vitro* araştırmalar, 'ortodonti' ile 'estetik ve konservatif tedavi' alanlarında kullanılan malzemeler ve tedavi yöntemleri konusunda önemli bilgiler sunmaktadır. Ancak, ortodonti alanında yapılan *in-vitro* çalışmaların sayısının artırılması gerekmektedir. Elde edilen bulgular, yayın dilinin atıf sayıları üzerinde bir etkisi olmadığını ve farklı dillerdeki çalışmaların da yaygın bir şekilde kabul gördüğünü ortaya koymaktadır.

Anahtar Kelimeler: Bibliyografik Veritabanları, Bibliyometrik Analiz, Dental Estetik, İn Vitro Teknikler, Ortodonti.

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Introduction

Orthodontics and aesthetic dentistry represent two intertwined specialties within the dentistry, each playing a pivotal role in the comprehensive care of patients.[1] Orthodontics is a dental specialty that corrects misalignments and positions teeth properly to establish a balanced bite and promote long-term oral health.[2] In recent years, the advancements in orthodontic technology, including clear aligners and digital treatment planning, have further enhanced the ability to provide precise and effective treatments that not only improve function but also contribute to aesthetic outcomes.[3] Aesthetic dentistry focuses on improving the visual features of the smile by enhancing dental appearance through color correction, form modification, and overall teeth presentation.[4] With the growing demand for aesthetic treatments, innovations such as minimally invasive veneers and teeth whitening have become integral components of modern dental practice.[5] The disciplines work together effectively, combining practicality with beauty to meet clinical needs and satisfy patients' desire for aesthetically pleasing results.[6–8] The relationship between orthodontics and aesthetic dentistry highlights the comprehensive approach to oral health, aiming to attain both ideal dental function and an attractive oral appearance, demonstrating the holistic approach to patient care in modern dentistry.[8,9] This synergy is increasingly recognized as essential in achieving optimal outcomes for patients, where both functional and aesthetic aspects are considered from the outset of treatment planning.

In-vitro studies in dentistry refer to research conducted outside of a living organism, typically in a controlled laboratory environment such as in test tubes, petri dishes, or other culture systems.[10,11] In dentistry, *in-vitro* studies play a significant role in advancing research and understanding various dental materials, techniques, and biological aspects of oral health.[12–15] By simulating oral conditions using cells, tissues, or synthetic models, *in-vitro* studies provide a foundation for clinical research, allowing for the controlled testing of hypotheses before transitioning to *in-vivo* settings.[10,16–18] The most significant advantages of *in-vitro* studies include their repeatability and the ability to simulate *in-vivo* conditions within a shorter timeframe, all while eliminating risks to human health.

In-vitro studies are vital for evaluating dental materials such as fillings, crowns, and implants by testing their strength, durability, and biocompatibility.[19,20] These studies also explore oral microbiology, examining how oral bacteria contribute to tooth decay and gum disease, and their interactions with dental materials.[21] Additionally, *in-vitro* research helps understand tooth movement and the effectiveness of orthodontic appliances.[22] The increasing complexity of dental materials and techniques has made *in-vitro* studies indispensable for ensuring the safety and efficacy of new treatments. It's crucial for the initial testing of new dental drugs for safety and efficacy, and for studying dental erosion caused by acidic substances or mechanical actions.[23,24] This research provides essential insights into dental health and treatment advancements, contributing to the development of more effective and patient-friendly dental care options.

Bibliometric analysis is a crucial tool for evaluating the scientific field, offering quantitative measures such as publication and citation counts, and h-index to assess researchers' or organizations' productivity and influence.[25–27] It allows for the objective evaluation of research effectiveness, identifies trends, emerging fields, and shifts in scientific interests, revealing collaboration patterns among scholars and institutions.[28] With the increasing emphasis on evidence-based practice, bibliometric analysis has become essential in identifying the most impactful research and guiding future investigations.[29] This analysis supports informed decision-making in research funding, policy development, and resource distribution, relying on bibliometric indicators for resource allocation decisions.[30–32] It facilitates comparisons across institutions, countries, and disciplines, identifying strengths and areas for improvement.[28,33–35] Bibliometric data is also vital for academic evaluations related to promotions, tenure, and hiring, and helps uncover under-researched areas or gaps in literature, thereby increasing transparency and aiding in systematic literature reviews and meta-analyses by pinpointing key papers and authors in specific fields.[27,36-38]

The TR Index was created following international standards to provide researchers with access to national and scientific data. It operated under the name of National Databases-UVT until the end of 2013. The TR Index, curated by ULAKBİM, comprises journals in the primary domains of science and social sciences, as well as the subdomains of dentistry, pharmacy, engineering, basic sciences, health sciences, veterinary, social sciences, and humanities. In the Turkish academic system, publishing in national journals indexed in the TR Index is often a requirement for academic promotion, which has led to an increase in the number of publications in these journals. This requirement, while promoting scientific output, also highlights the need to ensure that the quality of research remains high despite the growing quantity of publications.[39] This index is a valuable resource for conducting bibliometric analyses, particularly in fields like dentistry, where national and international research trends are crucial for advancing the discipline. The objective of this study is to assess the research conducted on orthodontics and aesthetic and conservative treatment through in vitro experiments as published in the dental publications indexed in TR Index.

Materials and Methods

This study is a bibliometric analysis of published literature and does not involve direct research on human participants or animals. Accordingly, informed consent and ethical approval were not applicable for this study.

The research was designed and conducted with a commitment to the highest ethical standards, in alignment with the principles of the Declaration of Helsinki for ethical research.

All studies are listed in the national database TR Index (https://trdizin.gov.tr/) using the keyword "*in-vitro*" and accessed the website in 13rd December 2023. Only publications in dental journals were included among all publication types in English, Turkish and other languages in 2021, 2022, and 2023. The publications were categorized based on the journal name, publication year, author institutions, departments, article type, article language, and number of citations. This information was then saved in the Excel software package (Microsoft Office Professional Plus 2020, USA). As a result of the examination of the records obtained, publications in the field of orthodontics and aesthetic and conservative treatment were included in this study (Figure 1).

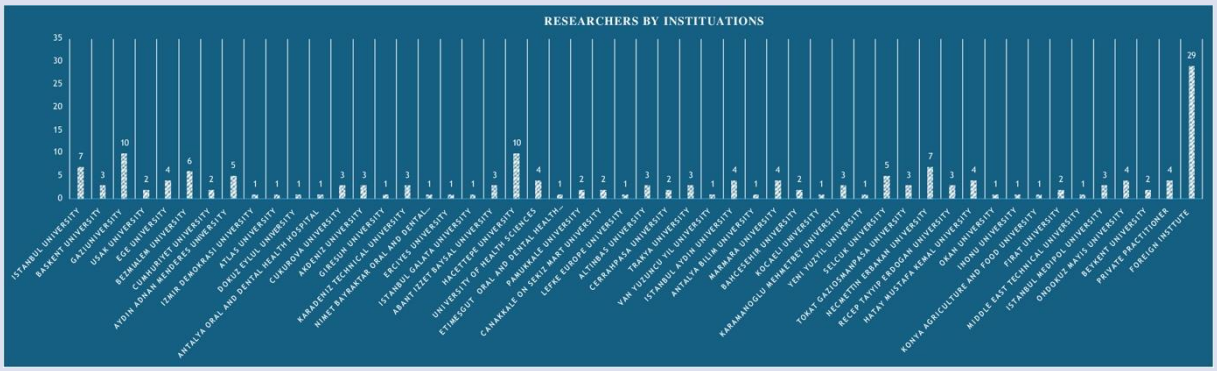

Figure 1: The distribution graph of researchers categorized by instituations

Statistical analysis

Statistical analyses were performed with NCSS (Number Cruncher Statistical System) 2007 Statistical Software (Utah, USA) package program.

In addition to descriptive statistical methods (mean, standard deviation, median, interquartile range), the distribution of variables was examined with the Shapiro-Wilk normality test, and the Mann Whitney U test was used to compare paired groups for variables that did not show normal distribution. The results were evaluated at a significance level of $p<0.05$.

Results

A total of 140 studies employing the *in-vitro* approach were identified. The studies were assessed based on their respective domains, and 83 of them were subsequently eliminated from the study. The excluded papers pertain to the fields of oral and maxillofacial surgery (4), endodontics (35), pedodontics (10), prosthodontics (28), periodontology (5), and oral diagnosis and radiology (1). Nine studies pertaining to orthodontics and forty-eight studies pertaining to aesthetic and restorative dentistry were accessed. Total of 57 studies are included as research articles (Table 1).

In 2021, 2022 and 2023, it was seen that the most publications were made in 2022 (n = 24). While it was determined that 44 publications received no citations, it was determined that there were 8 publications with 1 citation, 2 with 2 citations, 1 with 3 citations, 1 with 4 citations, and 1 with over 5 citations. The number of publications and citations by year are shown in Table 2.

When the journal citation counts examined, it was seen that the most citations were in European Oral Research (n = 14). It was determined that they were followed by Turkish Journal of Orthodontics (n = 5), International Dental Research (n = 4), and Selcuk Dental Journal (n = 3), respectively. Table 3 shows the number of publications and citations by journal. It was determined that European Oral Research was the journal with the most cited publications in the field of orthodontics and aesthetic and restorative dentistry related to *in-vitro* studies, thanks to a study with 11 citations (Table 3).

27 of the studies were prepared in Turkish and 30 in English. As a result of the Mann–Whitney U test, it was determined that the language did not make a significant difference in the number of citations (p = 0.562) (Table 4).

Detailed data on *in-vitro* studies in orthodontics in the TR Index shown in table 5 and in aesthetic and conservative treatment shown in table 6. The most cited *in-vitro* study in the field of orthodontics is study of Recen et al., published in the journal European Oral Research in 2021 and cited in 11 times (Table 5). The most cited *in-vitro* study in the field of aesthetic and conservative treatment is study of Yıldırım-Bilmez et al., published in the journal International Dental Research in 2021 and cited in 4 times (Table 6).

A total of 57 '*in-vitro*' titled studies were analyzed across various TR Index dental journals within the last three years. Only one of these studies was a 'review' article, while the remaining studies were identified as 'original research' articles. No 'case reports' or 'short communications' were found in the analysis. The journals with the highest number of *in-vitro* titled studies were Turkiye Clinics Journal of Dental Sciences, Cumhuriyet Dental Journal, and Selcuk Dental Journal. Turkiye Clinics Journal of Dental Sciences published the highest number

of *in-vitro* titled studies, with a total of 13 articles. Cumhuriyet Dental Journal and Selcuk Dental Journal both published 8 studies each, making them the next most prolific journals in this area (Table 5 and 6).

Figure 1 illustrates the distribution graph of researchers categorized by instituations. The instituations with the highest number of researchers conducting *in-vitro* studies are foreign institutes (n = 29). This is followed by Hacettepe (n = 10) and Gazi (n = 10) Universities.

Table 1. The distribution of *in-vitro* studies conducted by dentistry departments in TR Index over the past three years

	Year			
	2021	**2022**	**2023**	**Total**
Oral and Maxillofacial Surgery	1	3	0	4
Endodontics	20	13	2	35
Pedodontics	3	4	3	10
Aesthetic and Restorative Dentistry	19	21	8	48
Prosthodontics	11	9	8	28
Orthodontics	3	3	3	9
Periodontology	3	1	1	5
Oral Diagnosis and Radiology	1	0	0	1
Total	61	54	25	140

Table 2. Number of publications and citations by year 2021, 2022 and 2023

Year		**2021**	**2022**	**2023**	**Total**
Number of Publications		22	24	11	57
Number of Citations	**0**	16	20	8	44
	1	2	3	3	8
	2	1	1	0	2
	3	1	0	0	1
	4	1	0	0	1
	5 and over	1	0	0	1

Table 3. Journal citation counts

Journals	**Number of Citations**						
	0	**1**	**2**	**3**	**4**	**5 and over**	**Total**
European Oral Research	1	1	1	0	0	1 (11)	14
Turkish Journal of Orthodontics	0	3	1	0	0	0	5
Europen Annals of Dental Sciences	1	0	0	0	0	0	0
International Dental Research	3	0	0	0	1	0	4
Journal of Dental Faculty of Ataturk University	3	1	0	0	0	0	1
Cumhuriyet Dental Journal	7	1	0	0	0	0	1
Current Research in Dental Sciences	3	0	0	0	0	0	0
Turkiye Clinics Journal of Dental Sciences	12	1	0	0	0	0	1
Journal of Necmettin Erbakan University Faculty of Dentistry	1	1	0	0	0	0	1
Journal of Ege University Faculty of Dentistry	4	0	0	0	0	0	0
Turkish Endodontic Journal	1	0	0	0	0	0	0
Acta Odontologica Turcica	1	0	0	0	0	0	0
Selcuk Dental Journal	7	0	0	1	0	0	3
Total	0	8	4	3	4	11	30

Table 4. Assessment of the relationship between the number of citations of in-vitro studies published in Turkish and English in the fields of 'orthodontics' and 'aesthetic and conservative treatment'

	Number of Citations	**Median (IQR)**
Turkish (n=27)	0.21±0.63	0 (0-0)
English (n=30)	0.40±0.99	0 (0-0)
p	0.562	

*Mann Whitney U Test p value (*p<0.05)*

Table 5. Detailed data on in-vitro studies in orthodontics in the TR Index journals

Authors	Journal	Year	Number of Citations	Institute	Language	Research Type
Ibarra N., Saez M., Rojas V., Oyonarte R.	European Oral Research	2023	0	Foreign Institutions	English	Original Research
Uzunçıbuk H., Oztas S.E.	Turkish Journal of Orthodontics	2023	1	Istanbul University	English	Original Research
Gundog H., Ozcirpici A., Pamukcu H.	Turkish Journal of Orthodontics	2023	1	Baskent University	English	Original Research
Avan-Arslan B., Baloş-Tuncer B., Ulusoy M.Ç., Tuncer C., Yıldırım E., Bodur O.C.	Turkish Journal of Orthodontics	2022	1	Gazi University	English	Original Research
Titiz Skeskin-Erdogan Z., Tuna E.E., Aras A.	Turkish Journal of Orthodontics	2022	2	Usak University, London College University, Ege University	English	Original Research
Kılıc B., Doruk C.	Europen Annals of Dental Sciences	2022	0	Bezmialem University, Cumhuriyet University	English	Original Research
Ozant Y., Ay-Unuvar Y.	International Dental Research	2021	0	Aydın Adnan Menderes University	English	Original Research
Trakyalı G.	Journal of Dental Faculty of Ataturk University	2021	0	Istanbul Yeni Yuzyıl University	English	Original Research
Recen D., Yıldırım B., Othman E., Çömlekoğlu M.E., Aras I.*	European Oral Research	2021	11	Izmir Demokrasi University, Uşak University, Jacksonville University, Ege University	English	Original Research

**The most cited article*

Table 6. Detailed data on in-vitro studies in aesthetic and conservative treatment in the TR Index journals

Authors	Journal	Year	Number of Citations	Affiliation	Language	Research Type
Adham A., Ali A.	Cumhuriyet Dental Journal	2023	0	Foreign Institution	English	Original Research
Kalaivani M., Prasad D., Manoharan I., Sruthipriya M., Balachandran J., Pavankumar M.	European Oral Research	2023	1	Foreign Institution	English	Original Research
Keleş Z.H., Ozan G.	Current Research in Dental Sciences	2023	0	Atlas University, Istanbul University	Turkish	Original Research
Altınışık H., Erten H.	Current Research in Dental Sciences	2023	0	Gazi University, Dokuz Eylul University	English	Original Research
Yıldız B., Batmaz S.G., Dündar A., Barutçugil Ç.	Turkiye Clinics Journal of Dental Sciences	2023	0	Antalya Oral and Dental Health Hospital, Cukurova University, Akdeniz University	Turkish	Original Research
Naiboglu P., Kosar T.	Turkiye Clinics Journal of Dental Sciences	2023	0	Giresun University, Karadeniz Technical University	English	Original Research
Dogan A.N., Arslan S.	Turkiye Clinics Journal of Dental Sciences	2023	0	Nimet Bayraktar Oral and Dental Health Hospital, Erciyes University	Turkish	Original Research
Sarıalioğlu-Güngör A., Örcün M.E., Dönmez N.	Journal of Necmettin Erbakan University Faculty of Dentistry	2023	0	Istanbul Galata University, Bezmialem University, Abant Izzet Baysal University	Turkish	Original Research
Öz F.D., Gürgan S.	Turkiye Clinics Journal of Dental Sciences	2022	0	Hacettepe University	Turkish	Original Research
Baysal-Canyurt M., Aybala-Oktay E., Aydın N., Karaoğlanoğlu S.	Turkiye Clinics Journal of Dental Sciences	2022	0	University of Health Sciences	Turkish	Original Research

Altun B., Öz F.D., Bolay Ş.	Turkiye Clinics Journal of Dental Sciences	2022	0	Etimesgut Oral and Dental Health Hospital, Hacettepe University	English	Original Research
Cabadağ Ö.G., Misilli T.	Turkiye Clinics Journal of Dental Sciences	2022	0	Pamukkale University, Canakkale On Sekiz Mart University	English	Original Research
Lukarcanin J., Sadıkoğlu I. S., Turkun S., Turkun M.	Journal of Ege University Faculty of Dentistry	2022	0	Private Practitioner, Lefke Europe University, Ege University	English	Original Research
Durukan S.M., Gümüştaş B., Sismanoglu S.	International Dental Research	2022	0	Altınbas University, Cerrahpasa University	English	Original Research
Batmaz S.G., Susgun-Yildirim Z.	Turkiye Clinics Journal of Dental Sciences	2022	0	Cukurova University	Turkish	Original Research
Buyukgoze-Dindar M., Tekbas-Atay M.	International Dental Research	2022	0	Trakya University	English	Original Research
Aisa A., Bala O., Akgul S.	Journal of Ege University Faculty of Dentistry	2022	0	Gazi University	English	Original Research
Athira P., Dhanapal P., Kottoor J., Sagır M., Babu B.P.	Turkish Endodontic Journal	2022	0	Foreign Institution	English	Original Research
Moosavi H., Rezaee F., Afshari S., Sekandari S., Ahrari F.	Cumhuriyet Dental Journal	2022	0	Foreign Institution	English	Original Research
Bilgili D., Ozarslan M.	Cumhuriyet Dental Journal	2022	0	Van Yuzuncu Yil University, Akdeniz University	English	Original Research
Murrja E., Herguner-Siso Ş., Aydemir M., Ozturk H.N.	Cumhuriyet Dental Journal	2022	0	Istanbul Aydın University	English	Original Research
Kaya S., Ozel-Bektas O.	Cumhuriyet Dental Journal	2022	0	Antalya Bilim University, Cumhuriyet University	English	Original Research
Eyupoglu G.B., Serin-Kalay T.	Cumhuriyet Dental Journal	2022	0	Karadeniz Technical University	English	Original Research
Deniz Ş.B., Oğlakçı B., Elizguzeloglu-Dalkılıç E.	Acta Odontologica Turcica	2022	0	Marmara University, Bezmialem University	Turkish	Original Research
Berkman M., Altuntaş E., Tuncer S., Karabay F., Demirci M., Tekçe N.	Cumhuriyet Dental Journal	2022	1	Bahcesehir University, Marmara University, Istanbul University, Kocaeli University	English	Original Research
Kolus T., Tutku-Celik A.C., Ulker H.E.	Journal of Ege University Faculty of Dentistry	2022	0	Karamanoglu Mehmetbey University, Yeni Yuzyıl University, Selçuk University	Turkish	Original Research
Tonga G., Hatırlı H., Şirin-Karaarslan E.	Turkiye Clinics Journal of Dental Sciences	2022	0	Tokat Gaziosmanpasa University	Turkish	Original Research
Gonder H.Y., Elmacı İ., Karaköy H.	Journal of Necmettin Erbakan University Faculty of Dentistry	2022	1	Necmettin Erbakan University	Turkish	Original Research
Yıldız-Telatar G., Atıcı-Bedir M.G., Bedir F.	Current Research in Dental Sciences	2022	0	Recep Tayyip Erdogan University	Turkish	Original Research
Yıldırım-Bilmez Z., Seker O., Kose H.D., Gozuyesıl-Aslan B.*	International Dental Research	2021	4	Hatay Mustafa Kemal University	English	Original Research
Gurses M., Tagtekin D., Yanıkoglu F.	Selcuk Dental Journal	2021	0	Selcuk University, Marmara University	Turkish	Original Research
Fidan M., Dereli Z.	Selcuk Dental Journal	2021	0	Necmettin Erbakan University	Turkish	Original Research
Tutku-Celik A.C., Kolus T.	Selcuk Dental Journal	2021	0	Karamanoglu Mehmetbey University	Turkish	Original Research
Kaynar Z.B., Dogan T., Donmez N., Kazak M.	Journal of Dental Faculty of Ataturk University	2021	0	Okan University, Bezmialem University, Bahçeşehir University	Turkish	Original Research

Hatırlı H., Kılınç E., Şirin-Karaarslan E.	Journal of Dental Faculty of Ataturk University	2021	1	Tokat Gaziosmanpasa University	Turkish	Original Research
Fidan M., Dereli Z.	Selcuk Dental Journal	2021	0	Necmettin Erbakan University	Turkish	Review Article
Ozan G., Mert-Eren M., Vatansever C.	Selcuk Dental Journal	2021	0	Istanbul University, Altınbas University	English	Original Research
Atalay C., Uslu-Tekce A., Meral E., Yazıcı A.R., Ertan A.A.	Selcuk Dental Journal	2021	0	Hacettepe University	Turkish	Original Research
Yılmaz-Savas T., Savas A., Tuncdemir A.R.	Selcuk Dental Journal	2021	0	Selçuk University	Turkish	Original Research
Dayı B., Sezlev-Bilecen D., Eroksuz H., Yalçın M., Hasırcı V.	European Oral Research	2021	2	Inonu University, Konya Agriculture and Food University, Fırat University, Private Practitioner, Middle East Technical University	English	Original Research
Yılmaz N.A., Yavaşer R., Karagozler A.A.	Journal of Ege University Faculty of Dentistry	2021	0	Aydın Adnan Menderes University	Turkish	Original Research
Cilingir A., Mert-Eren M., Dikmen B., Gurbuz O., Ozsoy A.	Turkiye Clinics Journal of Dental Sciences	2021	0	Trakya University, Altınbas University, Istanbul Medipol University	Turkish	Original Research
Serinsoz F., Ertas E., Guler E.	Turkiye Clinics Journal of Dental Sciences	2021	0	Private Practitioner, Ondokuz Mayıs University	Turkish	Original Research
Turkyılmaz G., Tuncer T.N., Aytac-Bal F.	Turkiye Clinics Journal of Dental Sciences	2021	1	Abant İzzet Baysal University, Beykent University	Turkish	Original Research
Tastan E., Guler E., Aytac-Bal F.	Turkiye Clinics Journal of Dental Sciences	2021	0	Private Practitioner, Ondokuz Mayıs University, Beykent University	Turkish	Original Research
Dursun M.N., Atalay C.	Journal of Atatürk University Faculty of Dentistry	2021	0	Fırat University, Hacettepe University	Turkish	Original Research
Cabadag O.G., Misilli T., Gonulo N.	Selcuk Dental Journal	2021	3	Pamukkale University, Canakkale On Sekiz Mart University, Ondokuz Mayıs University	Turkish	Original Research
Azih N.F., Maqbool M., Halim M.S., Ab-Gnahi Z., Noorani T.	Cumhuriyet Dental Journal	2021	0	Foreign Institution	English	Original Research

**The most cited article*

Discussion

Orthodontics primarily deals with correcting teeth alignment and bite issues.[10] The straightening and proper alignment of teeth, achieved through orthodontic treatments like braces or clear aligners, significantly enhance the aesthetic appearance of a person's smile.[40,41] This improvement in appearance is a primary concern of aesthetic dentistry as well. Orthodontic treatments can reduce the need for more invasive aesthetic procedures by correcting the natural teeth's position and bite. Properly aligned teeth are easier to clean, reducing the risk of decay and gum disease, which can have aesthetic implications like staining and tooth loss. In many cases, a comprehensive treatment plan will include both orthodontic and aesthetic/conservative procedures.[1,41] Both orthodontics and aesthetic dental treatments significantly contribute to improving a patient's self-esteem and confidence by enhancing their smile. Orthodontics and aesthetic and conservative dental treatments are closely related in their goals to enhance oral health, function, and appearance. They often work hand in hand, where orthodontics lays the groundwork for aesthetic procedures, and both contribute to a patient's overall dental well-being and self-confidence.[1,40–42] For this reason, current studies from the last three years in the field of orthodontics and aesthetic and conservative treatment were evaluated together in our study.

In-vitro studies are conducted in a laboratory setting where researchers can precisely control the experimental conditions.[43] This allows for the isolation and study of specific variables without the interference of external factors. Due to the controlled conditions, *in-vitro* studies can be replicated easily, allowing for the verification and validation of results.[43] They enable quick assessment of outcomes. Unlike *in-vivo* studies that may take months or years to yield results, *in-vitro* studies can provide insights in a shorter period. They allow for the initial assessment of the safety and efficacy of new treatments and materials

before progressing to *in-vivo* or clinical trials. Conducting *in-vitro* studies is generally less expensive than clinical trials, making preliminary research more accessible and feasible. As they do not involve live human or animal subjects, *in-vitro* studies bypass many ethical concerns and regulatory hurdles associated with clinical trials.[24]

In this investigation, we examined the *in-vitro* studies included in the TR Index for these specific reasons. According to the results of the study, the branches of dentistry that performed the most *in-vitro* studies were aesthetic and restorative treatment (48), endodontics (35) and prosthodontics (28), while oral diagnosis and radiology (1) and oral and maxillofacial surgery (4) were indicated a lower frequency of *in-vitro* research. These results may indicate that areas of dentistry where a wider variety of materials are used place more emphasis on *in-vitro* studies. Furthermore, it can be inferred that there is a need for an increase in *in-vitro* investigations in the field of orthodontics, as the range of materials being utilized continues to expand daily.

When the results of our study are analyzed, it is seen that most of the studies included in the article relate to shear bond strength. The focus on shear bond strength in orthodontic research underscores its key role in treatment efficacy and safety, highlighting its importance in the durability of orthodontic bonding materials.[44] This emphasis supports the orthodontic field's goal to refine adhesives that withstand treatment stresses without harming tooth structure.[45] It also drives material innovation and suggests expanding research to include patient comfort, enamel health, and new technologies.[46] However, broadening research beyond shear bond strength could offer a fuller view of treatment impacts and advancements in orthodontics.

National bibliometric studies offer advantages for both the examination of existing research and the collection of demographic information. Assessing the scientific efficacy of a researcher or institution can be accomplished by gaining access to a national database.[33,36,47] In this study, because of the publications examined in TR Index, it was seen that the most *in-vitro* publications in the field of orthodontics and aesthetic and conservative treatment were made in 2021 (n = 22) and 2022 (n = 24). The coronavirus disease 2019 pandemic-induced stay-at-home measures are believed to have had a beneficial impact on academic productivity, particularly in the realm of laboratory investigations.[48,49] The most *in-vitro* publications were in Turkiye Clinics Journal of Dental Sciences (n = 13), Cumhuriyet Dental Journal (n = 8) and Selcuk Dental Journal (n = 8). These journals are believed to be more favored by scholars due to their effectiveness in promoting academic accomplishment, facilitating article review, and shortening publication processes.

It is important to address how editorship gatekeeping and insider bias may be connected to broader issues such as nepotism, power dynamics, and academic inbreeding.[39] So that it is essential to ensuring that publication practices remain fair and transparent, as biased practices can distort the scientific record and hinder the advancement of knowledge.[39] However, since the authors selected journals considering the scope of the published research, this may have contributed to the higher concentration of *in-vitro* titled studies in certain journals.

When the number of citations was evaluated, the year with the highest number of cited publication (number of citations = 11) was determined as 2021. The study conducted by Recen et al. in the field of orthodontics garnered a total of 11 citations and European Oral research, where this study was published, was the journal with the highest number of cited publications. Despite the belief that publishing the paper in English would enhance accessibility, no significant difference was observed in the number of citations between Turkish and English articles. Based on our research, we determined a low number of citations for publications focused on *in-vitro* investigations. Nevertheless, our analysis was limited to research published during the past 3 years. Therefore, we expect a rise in the number of citations in the future as other studies in the same subject are included into the existing literature. Upon analyzing the distribution of researchers based on institutes, it became evident that the majority of researchers originated from foreign institutes. This may be due to the fact that in studies conducted in a foreign country, a large number of researchers are together in one study. However, upon analyzing national research, it becomes evident that there are a maximum of five writers each study.

Online sites are highly efficient for gathering extensive publication data. Nevertheless, it is imperative to exercise caution while choosing the source. Google Scholar is a convenient and efficient tool for evaluation, as it provides a superior means of locating papers and is very accessible.[50,51] Nevertheless, it is organized in a manner that includes details about the author, irrespective of their affiliation with an organization. Hence, Google Scholar fails to generate precise metadata. The present study involved conducting research using the TR Index national database and evaluating the information from the articles.

Since our work includes up-to-date data and there is a lack of research in this particular area, it is anticipated to be valuable for researchers and eligible for inclusion in TR indexed journals. While there have been bibliometric studies investigating the TR Index articles, we have not discovered any study in the literature that specifically focuses on the keywords used in our analysis. This attribute makes our study unique.

This study has some limitations. Bibliometric studies involve analyzing a minimum of 100 publications or studies released over a span of at least 10 years. These studies summarize extensive bibliometric data to reveal the structure of academic activity and identify developing patterns within a specific study topic or field.[33,36,47] Although the number of data is more limited for the present study, this study examines studies in two different fields of dentistry, orthodontics and aesthetic and conservative treatment. Hence, further investigations may incorporate more extensive data. Also, it's important to note that bibliometric analysis should be used

cautiously and in conjunction with qualitative assessments. Our analysis exclusively focused on studies whose titles contained the term '*in-vitro*'. Nevertheless, this study did not encompass *in-vitro* investigations conducted in the field of orthodontics, aesthetic and conservative treatment, and other domains of dentistry. Hence, it may be asserted that not all *in-vitro* investigations in the TR Index could be assessed. For future research, a more comprehensive investigation can be designed by finding *in-vitro* studies that are focused on the most used keywords.

Conclusions

In-vitro studies are essential in advancing dental research, particularly in orthodontics and aesthetic and conservative dentistry. Evaluating and promoting '*in-vitro*' titled studies in TR Index journals can help enhance the visibility and importance of national research in dentistry. Despite the limitations of our study, the findings contribute to a better understanding of research trends in Turkish dentistry journals and highlight areas for further exploration.

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