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Bibliometric Analysis of Permanent Tooth Avulsion Articles in the Web of Science Database

Web of Science Veri Tabanında Daimi Diş Avulsiyonu Makalelerinin Bibliyometrik Analizi

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ABSTRACT Objective: This study aims to conduct a bibliometric analysis of research on permanent tooth avulsion in the Web of Science database, assessing trends and the general state of research in this field. **Material and Methods:** The research was conducted on March 14, 2024, using the keyword "permanent tooth avulsion" in the Web of Science database. Only research articles published in English between 1991 and 2024 were included. A total of 467 studies were found, and after necessary filtering, 458 articles were included in the analysis. Data were downloaded in BibTeX format and analyzed using Biblioshiny software. The analysis focused on criteria such as the number of authors, keywords, journals, and countries. **Results:** After filtering, 458 research articles were evaluated, involving 1,523 authors, 686 keywords, and 132 sources. The year with the most publications was 2021. Dental Traumatology was the journal with the most publications. Andersson L. had the most publications, and Kuwait University had the most contributions. Brazil was the leading country in research output. The most commonly used keywords were "teeth" (126), "replantation" (121), and "management" (90). **Conclusion:** The study provides a bibliometric analysis of research on permanent tooth avulsion, revealing important trends and offering insights into key authors, journals, institutions, and keywords. The findings provide critical data to improve the clinical management of avulsion cases and inform dental education. This analysis contributes to the development of more effective treatment methods and better patient care in dentistry.

Keywords: Tooth avulsion; bibliometric analysis; database

ÖZET Amaç: Bu çalışmanın amacı, daimi diş avulsiyonu ile ilgili yapılan araştırmaların Web of Science veri tabanında bibliyometrik analizini yaparak, bu alandaki araştırma trendlerini ve genel durumu değerlendirmektir. **Gereç ve Yöntemler:** Araştırma, 14 Mart 2024 tarihinde Web of Science veri tabanında "daimi diş avulsiyonu" anahtar kelimesi kullanılarak gerçekleştirilmiştir. 1991-2024 yılları arasında yayımlanmış ve yalnızca İngilizce dilinde yazılmış araştırma makaleleri dâhil edilmiştir. Toplam 467 çalışma bulunmuş, gerekli filtrelemeler sonrasında 458 makale değerlendirmeye alınmıştır. Veriler BibTeX formatında indirilmiş ve Biblioshiny yazılımı kullanılarak analiz edilmiştir. Analiz kapsamında yazar sayıları, anahtar kelimeler, yayımlandıkları dergiler ve ülkeler gibi kriterler incelenmiştir. **Bulgular:** Gerekli filtrelemeler sonucunda, 458 araştırma makalesi değerlendirmeye alınmıştır. Bu makalelerde 1.523 yazar yer almış, 686 anahtar kelime kullanılmış ve 132 kaynak belirtilmiştir. En çok makale yayımlanan yıl 2021 olarak belirlenmiştir. Dental Traumatology dergisi, en fazla makalenin yayımlandığı dergi olarak öne çıkmıştır. Andersson L., bu alanda en çok yayına sahip yazar, Kuwait Üniversitesi ise en çok yayına sahip üniversite olarak belirlenmiştir. En fazla araştırma yapılan ülke Brezilya olup, en sık kullanılan anahtar kelimeler "teeth" (126), "replantation" (121) ve "management" (90) olmuştur. **Sonuç:** Bu çalışma, daimi diş avulsiyonu araştırmalarının bibliyometrik analizi ile diş hekimliği alanındaki mevcut durumu ve gelişim eğilimlerini ortaya koymaktadır. Bulgular, önemli yazarlar, dergiler, kurumlar ve anahtar kelimeler hakkında değerli bilgiler sunarak, gelecekteki araştırmalara yön vermektedir. Diş hekimliği pratiğinde avulsiyon vakalarının yönetimini iyileştirmek ve ilgili eğitim programlarını geliştirmek için kritik veriler sağlamaktadır. Bu analiz, diş hekimliği alanında daha etkili tedavi yöntemlerinin geliştirilmesine ve hasta bakım kalitesinin artırılmasına katkıda bulunmaktadır.

Anahtar Kelimeler: Diş avulsiyonu; bibliyometrik analiz; veri tabanı

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Injuries in the oral region constitute 5% of all injuries.[1] The transition to school age increases the frequency of these injuries in children, with the number rising to 18%.[2] Avulsion, particularly common in the pediatric population, is a serious injury. Literature reviews show that avulsion of permanent teeth occurs in 0.5-16% of all dental injuries.[3] The prognosis of avulsed permanent teeth greatly depends on the interventions performed at the site of the accident. It is crucial to raise awareness among families and teachers about first aid treatment for avulsed teeth. The treatment options and prognosis for an avulsed tooth are largely determined by the vitality of the periodontal ligament and the maturity of the root.[4] Generally, the prognosis for avulsion is seen to be worse due to tooth loss.[5] The most important factor ensuring a good prognosis is the initial intervention at the moment of trauma.[6] In the replantation of avulsed teeth, due to the critical importance of the degree of damage, the tooth should be repositioned into its socket as soon as possible to prevent further damage to the periodontal membrane.[6]

Bibliometric analysis is an analysis that provides a general evaluation of a research field using data such as keywords, classification codes, authors, and citations.[7] The interest in studies conducted with this type of analysis is increasing day by day with the rapid advancement of technology and computer use.[8] This analysis evaluates studies conducted in any academic field by looking at various parameters (subject, year, keywords, number of authors of works, citations, etc.), providing findings related to the scientific status. The data presented as a result of this analysis are valuable for evaluating the current state of any discipline or branch of science, identifying problems, and solving them.[9]

Bibliometrics was first defined by Allan Pritchard in 1969 in his work titled "Statistical Bibliography or Bibliometrics." He described bibliometrics as 'the application of mathematical and statistical methods to books and other media of communication.' Ten years after this definition, Aiyepeku and Ehikhamenor defined bibliometrics as the analysis of books, journal articles, and other graphical communications through statistical and mathematical techniques, focusing on the characteristics of formulated knowledge transfer to assess the direction and development of a discipline.[10] An in-depth analysis of the literature on a given topic using bibliometric methods can provide information for future studies.[11] The facilitation of obtaining large volumes of bibliometric data by scientific databases like Scopus and Web of Science, and the ability of bibliometric software such as Gephi, Leximancer, and VOSviewer to analyze these types of data in a very pragmatic way, have increased interest in these studies.[12]

This study aims to examine the studies published between 1991 and 2024 on avulsion in permanent teeth from a bibliometric perspective, revealing the trends in this field over the last 33 years. This study is significant as it presents the current state of research on permanent tooth avulsion and will guide researchers planning to work on this topic regarding resources. The decision to conduct this study was made after a literature review revealed a lack of sufficient bibliometric studies on avulsion in permanent teeth.

MATERIAL AND METHODS

DATA COLLECTION AND ANALYSIS

The data for this study were obtained from the Web of Science database on March 14, 2024. The study included articles published between 1991 and 2024 under the title "permanent tooth avulsion." The data were downloaded in BibTeX format from the Web of Science database and analyzed using Biblioshiny software. Biblioshiny, which is part of the Bibliometrix package, operates on the RStudio platform and facilitates the detailed and systematic analysis of data. The analysis included various parameters such as the journals in which the articles were published, the authors, countries, keywords, and author collaborations. The version of Biblioshiny used was 4.0.5.

INCLUSION AND EXCLUSION CRITERIA

The study included only publications written in English and of the research article type. The inclusion criteria covered articles published in the Web of Science database under the title "permanent tooth avulsion." Exclusions included conference papers, book chapters, and articles published in languages other than English.

The accuracy of the data set was ensured by two independent researchers. The researchers meticulously reviewed the data set and resolved any discrepancies through discussion. The data screening and analysis were conducted by two researchers to enhance the accuracy and reliability of the analyses. The number of citations from the articles could not be analyzed using this program, which is noted as a limitation of the study.

DATA ANALYSIS

The specific parameters evaluated in the analysis included:

Document Types: Articles, proceedings papers, early access articles, and conference papers.

Author Collaborations: The number of authors per article and the rate of international collaborations.

Keywords: The keywords used in the articles and their frequencies.

Journals: The journals in which the articles were published and their impact factors.

Countries: The countries where the articles were published and their research intensities.

In the Results section, the findings based on these parameters are presented in detail. The results are evaluated based on criteria such as the number of articles, author collaborations, the most frequently used keywords, and the journals in which they were published, revealing the research trends in these areas.

RESULTS

This study is limited to works related to avulsion in permanent teeth that are available in the Web of Science database between 1991 and 2024 as seen in Table 1. Other databases containing publications on avulsion in permanent teeth have been excluded from the scope of the research. A total of 132 sources were accessed, and a growth rate of 2.12% was identified. The research has benefited from 686 keywords. It has been determined that 1,523 authors have researched the topic. A total of 458 articles have been accessed, and it has been noted that 7 articles are in early visibility.

TABLE 1: Main information about the data.

Description	Results
Timespan	1991:2024
Sources (Journals, Books, etc)	132
Documents	467
Annual growth rate %	2.12
Document average age	10.8
Average citations per doc	19.56
References	0
Document Contents	
Keywords plus (ID)	686
Author's keywords (DE)	746
Authors	
Authors	1,523
Authors of single-authored docs	24
Authors Collaboration	
Single-authored docs	27
Co-Authors per Doc	4.09
International co-authorships %	14.78
Document Types	
Article	458
Article; early access	7
Article; proceedings paper	2

Access to author, journal, title, abstract, and language information was found to be quite high. In Figure 1, the year with the highest number of publications was 2021, with 33 publications. In Figure 2, it has been concluded that the journal with the most publications is Dental Traumatology, with 173 publications and an h-index of 39. The second-ranking journal is Endodontics\& Dental Traumatology, with 21 publications and an h-index of 16. The researcher with the most work in this field is Andersson L., who has 19 publications and an h-index of 14. In second place is POI WR with 15 publications. As seen in Figure 3, the institution with the most publications on avulsion in permanent teeth is Kuwait University, with 38 publications, followed by UNIV FED MINAS GERAIS. The countries with the most publications in this field are Brazil, the USA, and Türkiye as shown in Figure 4. The most frequently used keywords are “teeth” (126), “replantation” (121), and “management” (90).

This study aims to examine the works published between 1991 and 2024 on avulsion in permanent teeth from a bibliometric perspective, revealing

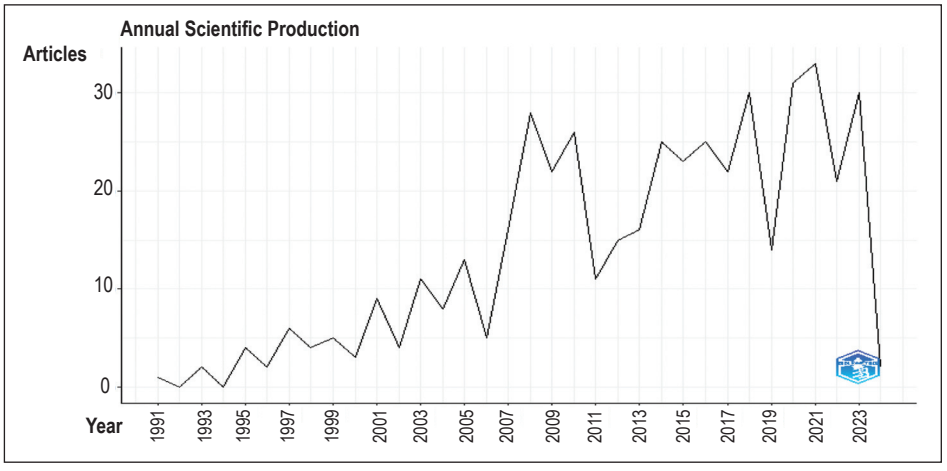

FIGURE 1: Annual scientific production.

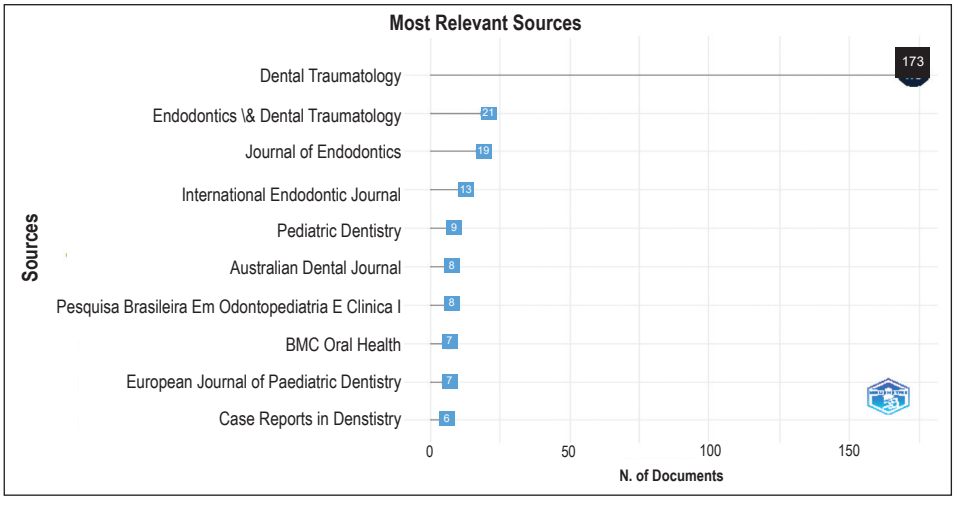

FIGURE 2: Distribution of articles by journals.

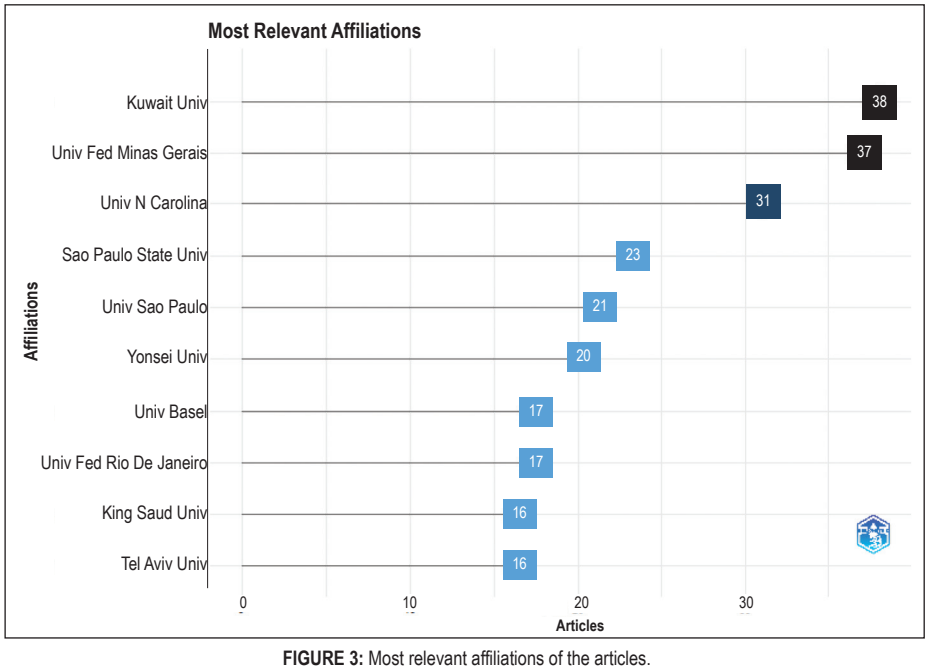

FIGURE 3: Most relevant affiliations of the articles.

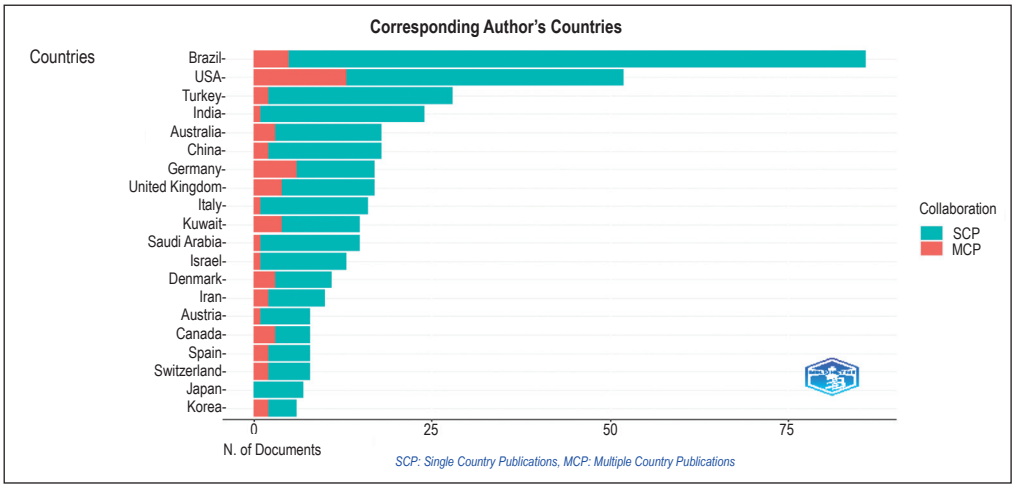

FIGURE 4: Corresponding author's countries.

trends in this field over the last 33 years. When examining bibliometric analysis studies in the literature, it is seen that there are studies showing similarities and differences with this research.

DISCUSSION

Looking at the literature, the study titled "Bibliometric Analysis of Telemedicine and E-Health Literature" aims to investigate the past patterns of telemedicine and e-health research over the last decade. The Scopus database was used for this research. The study, which was conducted on 1,401 articles, aimed to reveal the most cited authors, journals, institutions, countries, and articles. The findings reflect the growth trend of publications, the model of authors, and the distribution of articles and key journals.[13] This study differs in using the Scopus database, whereas our study utilized the Web of Science database.

In the literature, a bibliometric study on 'individuals experiencing homelessness' was found, covering the years 2003-2016. After a systematic review process from five databases, a total of 50 published articles were selected. Despite experimental studies being rare and sample sizes typically small, they concluded that studies analyzing the impact of Information and Communication Technologies on health were beneficial. This study covers articles from 1991-2024, thus reaching a broader sample group.[14] Both studies included only articles in their research.

Another study on telemedicine conducted a bibliometric analysis for the years 1993-2012, revealing that the total growth in telemedicine literature over the last twenty years was significant but varied by country and over time. While the United States led the world in the cumulative number of telemedicine publications, it was noted that the annual number of publications showed inconsistency over the last twenty years.[15] Similarly, our study found inconsistencies in the number of publications over the years, but it was noted that the country with the most publications was not America but Brazil, with America ranking second.

Another study using the Web of Science database related to healthy living mentioned a growth rate of 26% since the year 2000.[16] Using the same database is a similar aspect of our study, whereas the growth rate observed in studies related to avulsion in permanent teeth was found to be 2.12%.

Bibliometric analysis studies in the field of dentistry are increasingly prevalent in the literature. The bibliometric analysis study utilizing the Scopus database, which quantitatively and qualitatively analyzes publications on dental caries detection, provides insights into trends and patterns in dental caries research.[17]

There exists a bibliometric analysis study on the use of platelet-rich fibrin (PRF) in dentistry, which examines the evolving trends in PRF application and

analyzes various types of studies, including the most commonly used study designs, clinical trials, randomized controlled trials, and reviews/meta-analyses.[18] Another study, which examines research trends in dental ergonomics through bibliometric analysis using data obtained from the Scopus database, focuses on keywords such as ergonomics and musculoskeletal disorders.[19] In another study that analyzed the bibliometric characteristics of the top 100 most-cited articles on permanent tooth avulsion, data obtained from the Web of Science Core Collection were used to evaluate various parameters such as citation count, authors, institutions, countries, and publication years, similar to our study. The study found that observational studies from Europe focusing on prognosis or treatment had higher citation rates.[20]

Another study, which examined the sequelae observed in primary and permanent teeth over a 14-year follow-up period after dental trauma, has made significant contributions to the literature in dental traumatology. Using bibliometric analyses, this study has provided important findings related to dental injuries.[21]

The limitations of our study include the inclusion of only articles in English and the evaluation of only research articles scanned in the Web of Science database. This study has several limitations that need to be considered when interpreting the results. Firstly, the study exclusively utilized the Web of Science database, omitting other significant databases such as Scopus, PubMed, and Google Scholar (Google, USA). This exclusion could result in the oversight of important studies present in those databases. Secondly, the study included only articles published in English, excluding potentially valuable research published in other languages, which may limit the generalizability of the findings. Thirdly, the analysis conducted using Biblioshiny software did not encompass citation analysis of the articles, thereby restricting a comprehensive assessment of the impact of the studies. Fourthly, the study focused on articles published between 1991 and 2024, potentially omitting earlier influential studies that could provide a more comprehensive historical context. Additionally, the study was confined to the keyword "permanent tooth avulsion," potentially excluding relevant studies published under different keywords or related topics. Lastly, the technological and methodological limitations of the bibliometric software and analysis methods used could influence the manner in which data were analyzed and the results obtained. Considering these limitations is crucial for accurately interpreting the findings and addressing these gaps in future research.

This study employs a comprehensive bibliometric approach to analyze research on permanent tooth avulsion, providing a robust tool for elucidating current research trends and developments in the field. Utilizing the extensive and prestigious Web of Science database enhances the reliability and validity of the obtained data. Furthermore, the use of Biblioshiny software allows for detailed and systematic data analysis, increasing the accuracy and scope of the results. By covering articles published over a significant time span (1991-2024), the study reveals long-term development trends in the field. This research offers valuable insights into key authors, journals, countries, and keywords, serving as a guide for future studies. Additionally, the study's provision of critical data for improving the management of avulsion cases in dental practice and for developing relevant educational programs represents a significant practical contribution.

CONCLUSION

This study provides a bibliometric analysis of research conducted in the field of permanent tooth avulsion, revealing current trends and developments within dentistry. The findings offer valuable insights into key authors, journals, institutions, and keywords in this domain.

According to the data obtained, the literature on permanent tooth avulsion in dentistry is generally sufficient, but there is a need for further research in certain specific areas. The significant roles of the journal Dental Traumatology and authors like Andersson L. underscore the necessity for more studies in these areas. Additionally, the leading position of countries like Brazil highlights the need to enhance research activities in other regions.

The keyword analysis indicates that terms such as "teeth," "replantation," and "management" are

prominent, suggesting that these topics require more in-depth investigation. These findings provide crucial data for improving the management of avulsion cases in dental practice and developing related educational programs.

From a scientific contribution perspective, this study serves as a guide for future research by presenting the current state and developmental trends in permanent tooth avulsion studies. The findings offer researchers new areas of study and research topics, thereby significantly contributing to the body of knowledge in dentistry. Consequently, this study aims to enhance the effective management of avulsion cases and improve patient care quality.

In conclusion, this study expands the existing literature on permanent tooth avulsion and serves as an important reference for future research. By identifying gaps in the current knowledge, it offers new research directions and topics for researchers.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Elif Esra Özmen, Tuğçe Nur Şahin;* ***Design:*** *Elif Esra Özmen, Tuğçe Nur Şahin;* ***Control/Supervision:*** *Elif Esra Özmen, Tuğçe Nur Şahin;* ***Data Collection and/or Processing:*** *Elif Esra Özmen;* ***Analysis and/or Interpretation:*** *Tuğçe Nur Şahin;* ***Literature Review:*** *Elif Esra Özmen, Tuğçe Nur Şahin;* ***Writing the Article:*** *Elif Esra Özmen;* ***Critical Review:*** *Tuğçe Nur Şahin;* ***References and Fundings:*** *Elif Esra Özmen, Tuğçe Nur Şahin.*

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