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Research Article

Contribution of Türkiye to the Field of Endodontology: A Visualized Bibliometric Analysis Based on Web of Science

Olcay Ozdemir, Yagiz Ozbay, Neslihan Yilmaz Cirakoglu

Karabük University, Faculty of Dentistry, Department of Endodontics, Karabük, Türkiye

Abstract

Aim: To determine the current status and trend of endodontic research in Türkiye.

Materials and Methods: A comprehensive literature survey was conducted using the Clarivate search engine. Keyword selection was as follows: "Endodontics" and "Türkiye". All publications until May 2022 were included. The search was restricted to endodontics. Title, first author, country/institute, journal name, publication year, citation, abstracts, and keywords were recorded. VOSviewer version 1.6.10 software was used to map the bibliometric network of the exported data that has an automatic term identification algorithm.

Results: A total of 672 articles between 1985-2022 years were included. The scientific contribution rate of Türkiye was found 4.12% in the field of Endodontology. The highest number of publications is in the category of 'Dentistry Oral Surgery Medicine' with 588 articles and 384 (73%) published by Journal of Endodontics.

Conclusion: This bibliometric analysis highlights Türkiye's contribution to the field of Endodontology. Research articles have been contributed by various authors and institutions.

Keywords: Bibliometric analysis, citation, endodontics

INTRODUCTION

The field of Endodontics involves a variety of clinical interventions that covers a variety of research areas including clinical, mechanical, biological, and materials science subjects (1,2). Endodontology is a field of dentistry that deals with pathologies and injuries of the pulp and periradicular tissue and their relationship to systemic conditions (3). The specialty covers both clinical and basic sciences, including the diagnosis, etiology, treatment, and prevention of pulpal and periradicular pathologies (1). New progress in materials and clinical techniques target better outcomes in endodontic treatment practice.

The visualization analysis of the articles using bibliometrics not only presents a historical overview of scientific progress but also reveals trends in ongoing research (4). Bibliometrics uses quantitative measures to evaluate academic productivity. The field is growing rapidly with the production of new parameters, assessment tools, and normative data (5). Bibliometric visualization is an important type of analysis in evaluating published articles, authors, journals, and publishing institutions and revealing data such as the scientific activity of countries and international co-authorship (3,6-10).

In the field of endodontics, such an analysis was first published in 2011 by Fardi et al by Journal of Endodontics, one of the journals with the highest impact factor (10). In the study, the 100 most cited articles were determined by the bibliographic data of various endodontic journals. Data from these publications showed that the most common research subfield was endodontic microbiology, the most widely published type of article was basic science, and the clinical studies were mostly observational. Similar to Fardi et al., it was stated that endodontic microbiology is the most studied subject according to the analysis carried out by Yılmaz et al (4). In addition, the researchers reported for the first time that regenerative endodontics is the second most studied topic. They stated that the number of basic science articles and reviews is higher than in clinical studies, and there is a greater need for randomized clinical trials and studies with high levels of evidence, such as meta-analysis, in the literature.

Türkiye also has a significant contribution to the scientific field of endodontics and thus this study aimed to highlight Türkiye's contribution by utilizing a bibliometric analysis

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Corresponding Author: Olcay Ozdemir, Karabük University, Faculty of Dentistry, Department of Endodontics, Karabük, Türkiye
E-mail: ozdemir.olcay@yahoo.com

and determining the current status and trends of research.

MATERIAL AND METHOD

A comprehensive systematic literature survey was conducted to identify the related researches in the field through online database, including Thomson Reuters Web of Science, by using the Clarivate search engine. The search strategy was as follows in all fields including the database: "Endodontics" and "Turkey". Keywords selection was conducted with the purpose of search optimization to locate every related publication. All publications until May 2022 were included. The search was restricted to mainly focusing on endodontics. Proceeding papers, conference papers, editorial materials or letters, corrections, notes, and early access papers were excluded from the study. The data including the full record and cited references were exported using the 'tab-delimited file' tool. Title, first author, country/institute, journal name, publication year, citation, abstracts, and keywords were recorded. VOSviewer software 1.6.10 version (Centre for Science and Technology Studies, Leiden University, Netherlands) was used to mapping the bibliometric network of the exported data that has an automatic term identification algorithm (downloadable at www.vosviewer.com).

Questions to be answered in line with the purpose of this study:

- **Q1.** What is the distribution of articles published from Türkiye in the field of Endodontics by years?
- **Q2.** Which are the journals that publish articles from Türkiye in the field of Endodontics?
- **Q3.** What is the distribution of the most contributing researchers and institutions?
- **Q4.** Who are the most cited authors and which are the most cited publications from Türkiye?
- **Q5.** What is the international scientific contribution rate of Türkiye?

RESULTS

A total of 672 articles from 16,328 published by indexed journals (Web of Science Index, SCI-E, ESCI) between 1985-2022 years were included. The distribution of publications by year was presented in Figure 1 (Q1). The highest number of publications is in the category of 'Dentistry Oral Surgery Medicine' with 588 articles and 384 (73%) published by the Journal of Endodontics (Figure 2) (Q2). Hacettepe University in Ankara had the most contribution rate with the highest number of 105 articles (Figure 3) (Q3). Figure 4 presented the authors with the highest contribution by document count and total citations. Co-authorship, international collaboration, and research area according to the keywords presented in Figures 5,6,7 respectively. The 20 top-cited articles were presented in Table 1.

The oldest article available on the Web of Science, written by Alaçam & Yılmaz was published by the Journal of Endodontics in 1985. The number of authors that contributed to the area was 200 and, the most prolific author was Arslan H with 47 published articles (Q3). An evaluation of the root canal configurations published by Sert and Bayırlı in 2004 was the most cited publication (Table 1) (Q4).

The scientific contribution rate of Türkiye was found at 4.12% in the fields of Endodontics (Q5).

Table 1. 20 top-cited articles published from Türkiye

Rank	First Author	Publication Date	Type of Article	Subject Area	Citation
1	Sert & Bayırlı[11]	2004	Original Article	Root canal anatomy	269
2	Calt & Serper[12]	2002	Original Article	Root canal disinfection	251
3	Calıskan et al.[13]	1995	Original Article	Root canal anatomy	179
4	Gursoy et al.[14]	2013	Review Article	Root canal disinfection	163
5	Sen et al. [15]	1995	Original Article	Endodontic microbiology	147
6	Capar et al.[16]	2014	Original Article	Ni-Ti instruments	127
7	Eskitascioglu et al.[17]	2002	Original Article	Post-endodontic restoration	126
8	Cehreli et al.[18]	2011	Case Report	Regenerative endodontics	121
9	Erdemir et al.[19]	2004	Original Article	Root canal disinfection	115
10	Yoldas et al.[20]	2012	Original Article	Ni-Ti instruments	110
11	Ercan et al.[21]	2004	Original Article	Root canal disinfection	106
12	Nagas et al.[22]	2012	Original Article	Endodontic materials	105
13	Ari et al.[23]	2003	Original Article	Root canal disinfection	105
14	Yaltirik et al.[24]	2004	Original Article	Root canal sealers / cements	104
15	Calt & Serper[25]	1999	Original Article	Root canal sealers / cements	103
16	Dogan & Calt[26]	2001	Original Article	Root canal disinfection	100
17	Guneser et al.[27]	2013	Original Article	Root canal disinfection	92
18	Tinaz et al.[28]	2005	Original Article	Root canal anatomy	89
19	Ari et al.[29]	2004	Original Article	Root canal disinfection	89
20	Hakki et al.[30]	2009	Original Article	Root canal sealers / cements	88

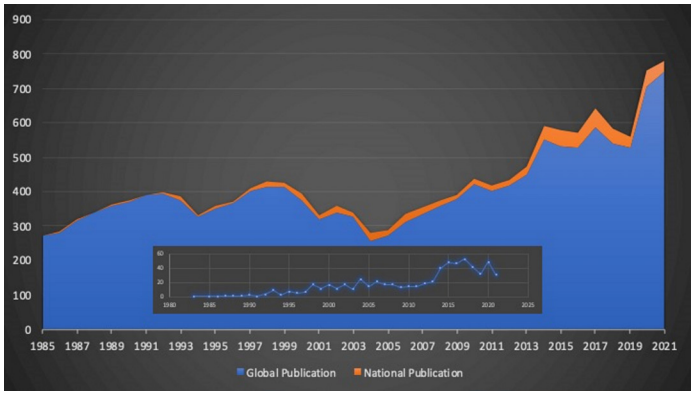

Figure 1. Distribution of publications from Türkiye in the field of endodontics concerning count and citation ranks by year

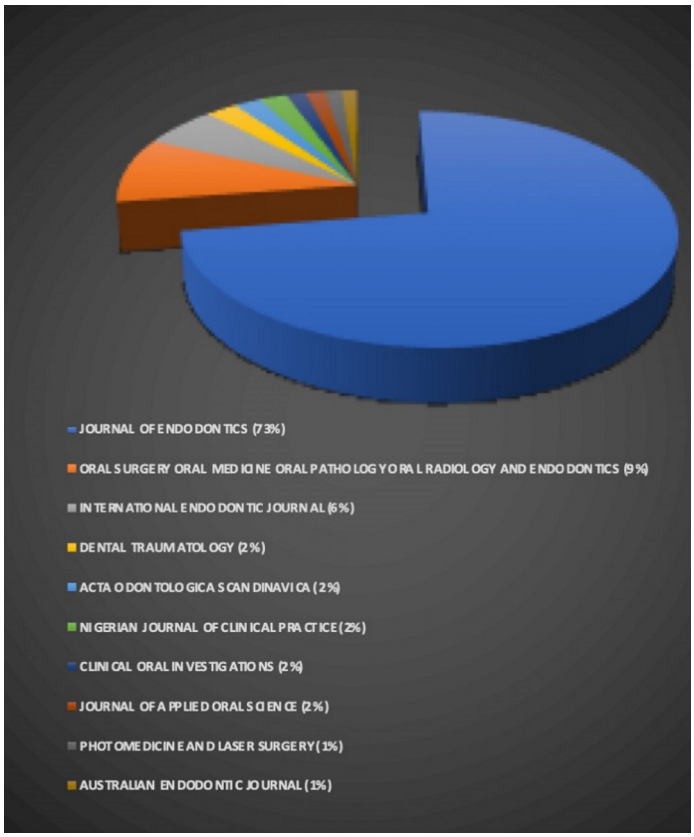

Figure 2. Distribution by journal which published maximum numbers of article from Türkiye in the field of endodontics (top 10)

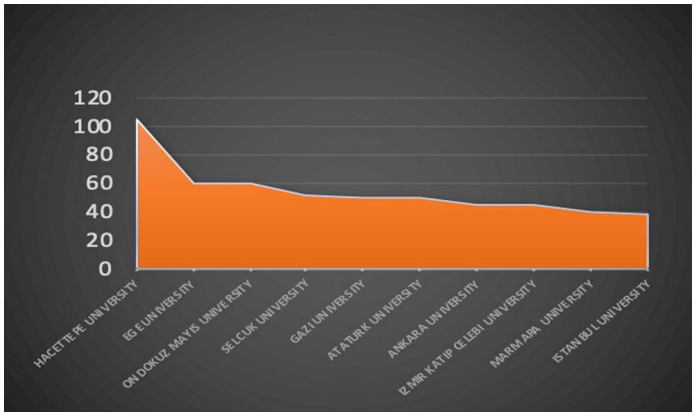

Figure 3. Institutional contribution rates of articles in the field of endodontics (top 10)

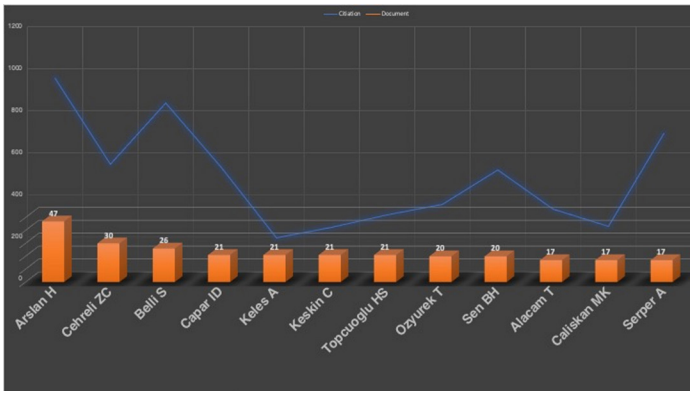

Figure 4. Author contribution by document with total citations in the field of endodontics (top 10)

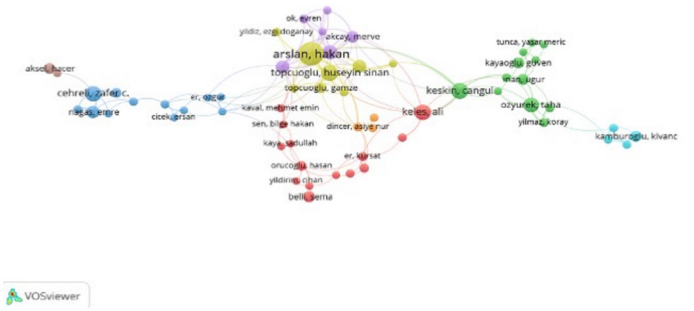

Figure 5. Co-authorship mapping of the researchers by VOSviewer analyzing

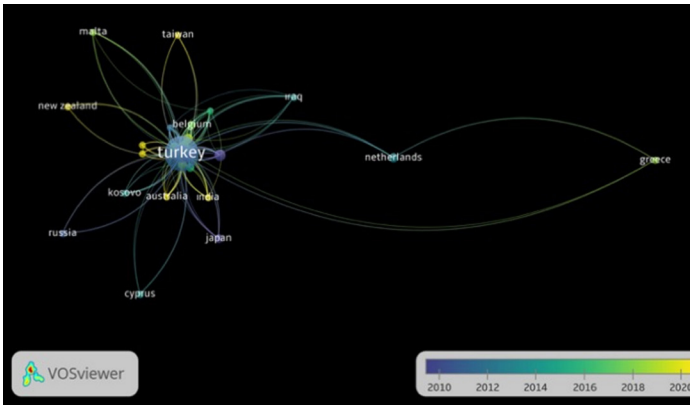

Figure 6. International collaboration of authors by year

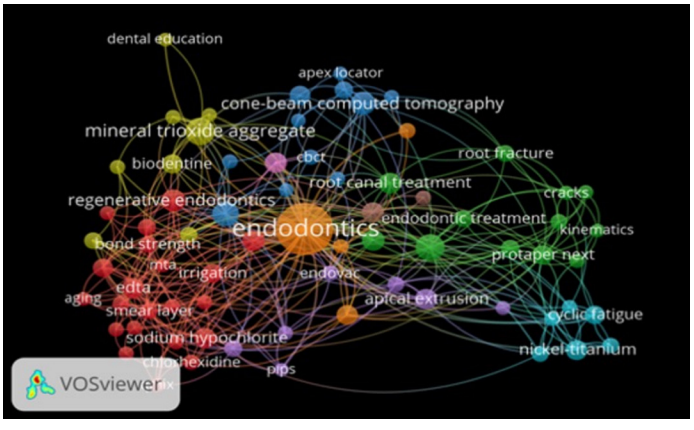

Figure 7. Research interest of publications from Turkiye in the field of endodontics by keywords

DISCUSSION

This study aimed to evaluate the impact of Türkiye's international contribution to the field of endodontics. The research outputs presented that the nationwide contribution to the international literature was 4.12%. Not only in endodontics, but Türkiye is also one of the most productive countries in terms of academic contribution to dentistry as a whole (31). In this study, an inconsistent increase in the number of publications is noticeable. The authors of the study believe this result is likely to be due to increase in the number of researchers, increase in the number of supported projects due to the increase in the number of academic institutions, academic promotion criteria, more accessible international databases, and national and international collaborations.

The main limitation of this study is that the database is limited to the Web of Science. Why Web of Science is not the only platform used for academic search. The fact that the articles in other international databases were not identified may have caused to observe a lower result than the current effect. However, for bibliometric analysis Web of Science is the most popular database so for this study methodology, it was preferred with analyzing with VOSviewer.

Hacettepe University had the most contribution with the highest number of articles. Tonta reported that Hacettepe ranked first in the contribution of Turkish universities and produced almost one-fourth of all biomedical publications worldwide between 1988-1997 (32). Hacettepe University's longstanding success might result from the earlier establishment of the university and well-established study groups.

The highest number of publications by Turkish researchers were published in the Journal of Endodontics. Considering the high impact factor and recognition of the journal, a higher density of manuscript submissions from Türkiye to such a leading journal is quite predictable.

The most used keywords in the studies were cone-beam computed tomography, retreatment, and mineral trioxide aggregate in descending order. It can be interpreted as the use of advanced imaging techniques amongst Turkish researchers has become common. It is also observed that core topics of endodontics such as irrigation and root canal preparation to more recent concepts such as lasers and micro-computed tomography are also studied by Turkish researchers (33,34).

Özbay & Özdemir reported that the most prolific country for laser-activated irrigation studies is Türkiye with the highest contribution rates (35). Our study results presented that almost half of the most cited studies were related to root canal disinfection and irrigation. For example, Calt & Serper presented important findings regarding EDTA flushing times and highlighted the drawbacks of using EDTA for more than 1 minute (12).

As imaging technologies improve, more and more information about root canal anatomies is emerging. However, in the past Çalışkan et al. and Sert & Bayırlı had studied by decalcification and root canal system staining and provided very comprehensive data to the literature on anatomical configurations (11,13). On the other hand, based on the current technology point of view, it was reported that Türkiye is among the most productive countries, especially in root canal anatomy studies.

Among the most cited studies, Şen et al. visualized the micron-level placement of microorganisms into the dentinal tubules using scanning electron microscopy. After fungi observation on the sections, the researchers suggested that it should be considered especially as a factor for persistent infections and in the disinfection protocol (15).

CONCLUSION

The present analysis was based on bibliometrics of Türkiye's contribution to the field of Endodontology. The analysis highlighted the productivity in the field to date and provided insight into the under-explored areas that can be improved to further the country's research output.

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Ethical approval: *For this type of study, ethical approval is not applicable, because any part of the research does not involve human participants, tissue, data, or animal subjects.*

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