Original Article

Bibliometric analysis of Saudi dental journals from time of inception to 2023

Heba H. Bakhsh [a], Suha Aljudaibi [a,*], Shatha Alnafissah [b], Norah Alali [c], Almaha Alghamlas [b]

[a] *Department of Preventive Dental Sciences, College of Dentistry, Princess Nourah bint Abdulrahman University, P.O. Box 84428, Riyadh 11671, Saudi Arabia*
[b] *College of Dentistry, Princess Nourah bint Abdulrahman University, P.O. Box 84428, Riyadh 11671, Saudi Arabia*
[c] *Pediatric Dentistry Resident, Riyadh, Saudi Arabia*

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ABSTRACT

Objective: To describe the patterns of authorship, collaboration, study type, specialty, and funding status of articles published in Saudi dental journals.
Methods: All articles published in Saudi dental journals in English from their inception to 31st December 2023 were identified. The following data were extracted using pre-pilot forms: publication date, number of articles, study type, authorship patterns, nature of collaboration, article specialty, and funding status. Descriptive statistics included the calculation of frequencies and percentages.
Results: Five Saudi dental journals were identified, with a total of 2574 published articles. The journal with the highest number of studies published was the *Saudi Dental Journal* (33 %), followed by the *Saudi Journal of Oral and Dental Research* (25 %), *Saudi Endodontic Journal* (17 %), *Journal of Orthodontic Science* (14 %), and *Saudi Journal of Oral Sciences* (11 %). The first authors of most studies were academics (89 %) and from Asian countries (84.3 %). The average number of authors per publication was four (standard deviation = 2). Approximately 13.13 % of the articles were solo-authored. International collaboration was observed in 14.76 % of the identified studies. One-quarter (24.3 %) of the studies were cross-sectional, and just under half of the publications were in the fields of endodontics and orthodontics. Furthermore, 8 % of the studies were funded.
Conclusion: The research output of Saudi dental journals was produced mainly by academics and involved national-level collaborations with a limited number of funded studies. Therefore, there is a need to encourage the publication of high-quality research and international research partnerships.

1. Introduction

Bibliometric analysis is defined as "the statistical evaluation of published scientific articles." It effectively measures publication influence in the scientific community (De Moya-Anegón et al., 2007; Schubert et al., 1989). Bibliometric analysis allows readers to acquire historical insights into and information on the growth of a specialization by detecting and analyzing the most-cited publications; this can aid academics in understanding emerging themes and future trends of a specific specialty. To some extent, bibliometric analysis is new in the dental field (Varghese et al., 2021).

Advanced education in Saudi Arabia has developed rapidly in recent years (Aquil and Al-Reyaee, 2019). Among Arab countries, Saudi Arabia plays a leading role in research activities in multiple disciplines. The Saudi government has established research centers in government hospitals and universities with the intent of enhancing the quality of scientific research (Rajeh and Khayat, 2021). A study by Haq and Al-Fouzan (2017), analyzing 6416 papers published by 22 Arab countries from 1998 to 2017, revealed that Saudi Arabia has played a significant role in the productivity of research in the Arab world. This growth in the number of published articles is attributed to the increase in the number of research institutions and universities (Ul Haq et al., 2019). In Saudi Arabia, Ul Haq and Al-Fouzan (2018) conducted the first bibliometric analysis in dentistry with authors associated with the King Saud bin Abdulaziz University for Health Sciences from 2007 to December 2017.

Due to an increase in the number of dental practitioners, institutions, and graduate programs, the number of dental publications has significantly increased. (Aquil and Al-Reyaee, 2019; Rajeh and Khayat, 2021).

One bibliometric study of publications from the Al-Jouf University identified 801 articles published between 2006 (3 articles) and 2017 (209 articles), reflecting a gradual annual increase (Aquil and Al-Reyaee, 2019). According to Rajeh and Khayat (2021), most published dental articles were cross-sectional studies (64.55 %), followed by systematic reviews and randomized controlled trials (20 % collectively). Approximately one-third (35 %) of the articles involved international collaborations with centers outside Saudi Arabia.

This study aimed to analyze the characteristics of articles published in dental journals in Saudi Arabia. The objectives of this study were to describe the patterns of authorship, collaboration, study type, specialty, and funding status of articles published in Saudi dental journals.

2. Methods

All English-language scientific journals published in Saudi Arabia in the field of dentistry were included in the study. The journals were identified through the official websites of Saudi dental societies and dental colleges. All articles published in these journals from their inception to 31st December 2023 were included. Data extraction from each journal was conducted manually by three authors using pre-piloted forms for 142 articles. Descriptive statistical analyses, including percentages and frequencies, were performed. The study protocol was approved by the Institutional Review Board at Princess Nourah Bint Abdulrahman University (IRB. 21-0523).

The following data were extracted from each article: publication date, study type, authorship pattern, nature of collaboration, specialty, and funding status. The number of articles published in each journal was also noted. Descriptive statistics were used to calculate frequencies and percentages. Author collaboration was classified as national or international. The study types were classified as bibliometric analysis; editorial; non-randomized controlled trial; randomized controlled trial; cross-sectional; in vitro; animal; retrospective cohort; prospective cohort; case report; case series; case-control; systematic review with *meta*-analysis; systematic review without *meta*-analysis; literature review; pilot or preliminary; and longitudinal studies. The specialty of each article was also noted. The data were compiled using Microsoft Excel (version 2.54).

3. Results

3.1. Chronological distribution and patterns of publication

A total of 2574 articles published in five dental journals were identified. The journal with the highest number of publications was the *Saudi Dental Journal*, with 853 articles (33 %), followed by the *Saudi Journal of Oral and Dental Research* (SJODR), with 642 (25 %); *Saudi Endodontic Journal*, with 439 (17 %); *Journal of Orthodontic Science*, with 357 (14 %); and *Saudi Journal of Oral Sciences*, with 283 (11 %). Data analysis revealed a substantial increase in the number of publications in 2021, when the number of studies published in all journals reached 383, and in 2023, with a total of 361 articles. From 2009 to 2019, there was a steady annual increase in the number of publications (Fig. 1).

3.2. Study type

The most common types were cross-sectional studies (24.3 %), accounting for one-quarter of studies, followed by in vitro studies (19.9 %), and case reports (16.9 %) (Table 1).

3.3. Number of authors per article

The number of authors ranged from 1 to 14 per article, with an

Table 1
Distribution of research papers based on study type.

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Cross-sectional study	24.30 %
In vitro study	19.90 %
Case report	16.90 %
Literature review	10.20 %
Randomized controlled trial	5.40 %
Systematic review without *meta*-analysis	4.90 %
Retrospective cohort study	4.47 %
Animal study	3.42 %
Editorial	2.37 %
Prospective cohort study	2.06 %
Systematic review with *meta*-analysis	1.60 %
Non-randomized controlled trial	1.10 %
Case series	0.93 %
Case control	0.80 %
Bibliometric analysis	0.35 %
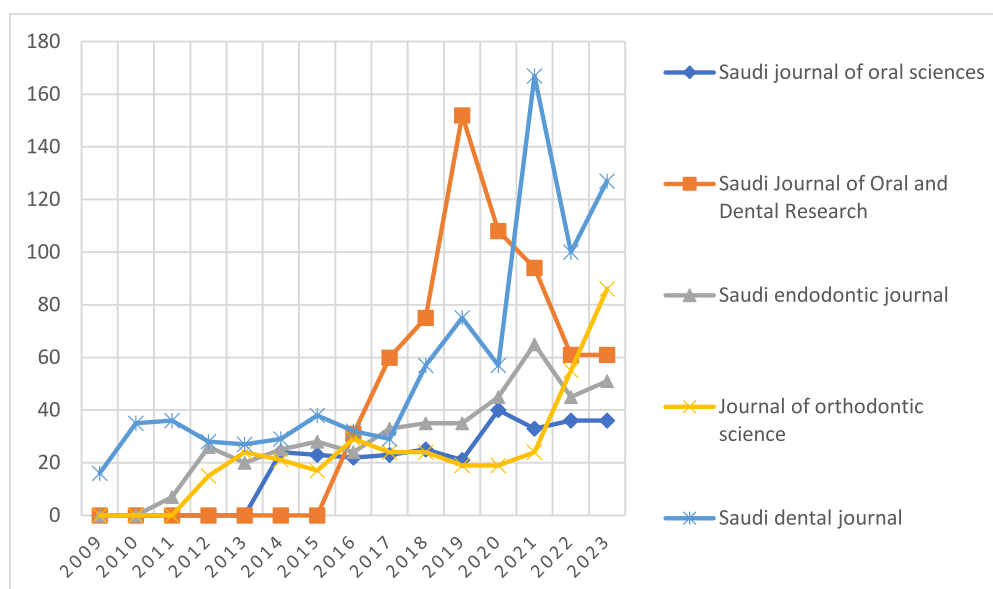
Fig. 1. Annual number of publications in each journal ($n = 5$).

average of 4 (SD=2). The most frequent authorship pattern was three (18.03 %), followed by four authors (15.11 %). Solo-authored articles accounted for 13.13 % of the articles, mainly observed in 2021. The most common study types for solo-authored papers were cross-sectional studies (20.7 %), followed by case reports (18.9 %) and literature reviews (17.1 %).

3.4. Geographic distribution of first authors

The first authors were predominantly from Asian countries (84.3 %), followed by countries in Africa (7 %), Europe (3.3 %), and South America (2.5 %) (Fig. 2). Saudi Arabia had the highest number of publications among Asian countries (45.2 %).

3.5. Institution affiliation of the first author

The majority of the first authors were academics (89 %), followed by clinical practitioners (9 %) (Fig. 3).

3.6. International collaboration

Only 14.76 % of the 2574 identified studies involved international collaborations. Saudi Arabia had the highest number of studies involving international collaborations (56 %), followed by India (23.4 %).

3.7. Article specialty

The dental specialty with the most publications was endodontics (23 %), followed by orthodontics (21 %); those with the least publications were pharmacology (0.4 %) and forensic odontology (0.3 %). Articles related to endodontics, orthodontics, and oral and maxillofacial surgery accounted for more than 50 % of all published articles in all five Saudi journals. The specialties with the highest number of publications in each journal were: public health in the *Saudi Journal of Oral Sciences*, oral and maxillofacial surgery in the *Saudi Journal of Oral and Dental Research*, periodontology in the *Saudi Dental Journal*, and orthodontics and endodontics in the other two specialized journals (Table 2).
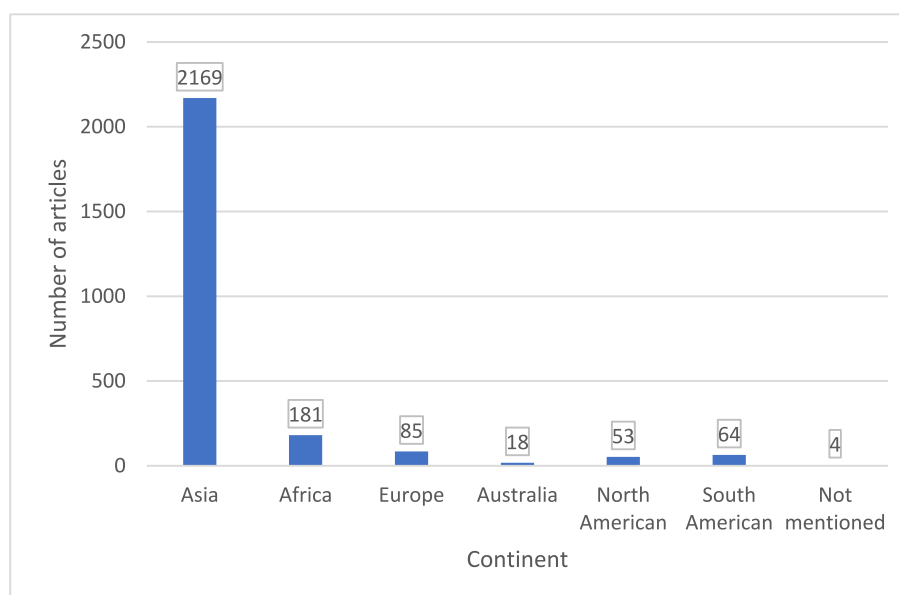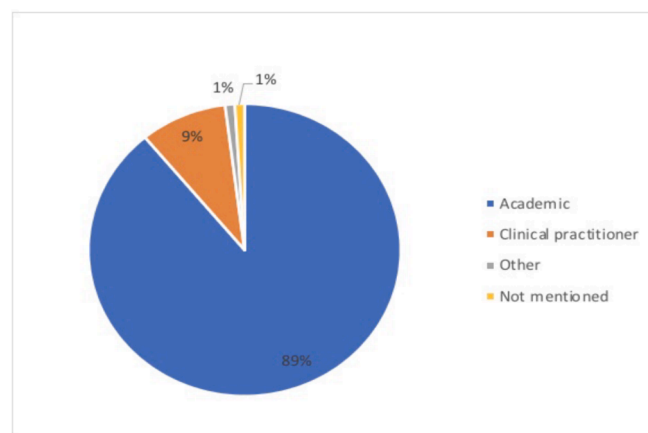
Fig. 3. Institution affiliation of the first author.

3.8. Funding status

There were few funded studies (8 %, 207 articles).

4. Discussion

Journal articles are a fundamental source of innovative scientific findings among researchers and clinicians (Alfadley et al., 2021). They are considered platforms where scientists put forth new theories, enhance knowledge, and form creative methods of practice (Warriach and Ahmad, 2011). The *Saudi Dental Journal*, which was launched in 2009 as an official publication, topped the list with one-third (33 %) of all identified research papers. The number of journals and publications in the dental field may be affected by the scope of research, the local culture of research, and funding (Liu et al., 2022).

Cross-sectional studies were the most common types of research published in Saudi dental journals. Similar findings were observed by Jahan and Al-Saigul (2017); among 561 original research studies, 93.4 % were cross-sectional. According to research published in the Brazilian Journal of Pediatric Dentistry for publications between 1998 and 2007, the most employed study designs were case reports (33 %) and cross-sectional studies (30 %). However, there were no systematic reviews or *meta*-analyses (Poletto and Faraco Junior, 2010). Moreover, in a

Fig. 2. Geographic distribution of articles, by continent, according to the first author's country.

Table 2
Distribution of publications in Saudi dental journals ($n = 5$) according to specialty.

Specialty	Saudi Journal of Oral Sciences	Saudi Journal of Oral and Dental Research	The Journal of Orthodontic Science	Saudi Endodontic Journal	Saudi Dental Journal
General Dentistry	12.4 % (35)	2.8 % (18)	0	0	5.5 % (47)
Endodontics	5.7 % (16)	9.6 % (62)	0	100 % (439)	9 % (76)
Orthodontics	3.5 % (10)	11.8 % (76)	99.4 % (355)	0	11.4 % (97)
Oral & Maxillofacial Surgery	11.66 % (33)	16 % (103)	0.6 % (2)	0	10.7 (91)
Public Health	21.5 % (61)	13.1 % (84)	0	0	4.6 % (39)
Prosthodontics	6.7 % (19)	11.1 % (70)	0	0	11.7 % (100)
Periodontology	6.4 % (18)	7.3 % (47)	0	0	18.4 % (157)
Oral Medicine	7.8 % (22)	9 % (58)	0	0	4.5 % (38)
Restorative dentistry	3.5 % (10)	4.5 % (29)	0	0	8.7 % (74)
Pathology/Microbiology	6.7 % (19)	4.5 % (29)	0	0	4.22 % (36)
Pedodontics	7.4 % (21)	4.8 % (31)	0	0	5.74 % (49)
Dental Materials	4.94 % (14)	3.9 % (25)	0	0	0.94 % (8)
Forensic Odontology	0	0.5 % (3)	0	0	0.6 % (5)
Oral & Maxillofacial Radiology	0.4 % (1)	0 % (0)	0	0	2 % (19)
Pharmacology	0.7 % (2)	0.8 (5)	0	0	0.6 % (5)
Oral Biology	0.7 % (2)	0.3 % (2)	0	0	1.4 % (12)

bibliometric analysis of the 100 most cited dental-related COVID-19 articles, the most frequent study types were narrative reviews (38 %) and cross-sectional studies (26 %) (Daltaban and Türker, 2023).

Previous studies (Yahya Asiri et al., 2020; Natto et al., 2019) have stated that dentistry research is currently focusing on descriptive studies (i.e., generating hypotheses) rather than on analytical ones (i.e., testing hypotheses). There were few randomized controlled trials in the current study (5.4 %). The limited number of randomized controlled trials, *meta*-analyses, and systematic reviews could raise concerns, given that these types of studies offer the most robust evidence according to the research evidence hierarchy. The low number of randomized controlled trials in the field of dentistry may be due to their expense and slowness, the difficulty of enlisting appropriate patients, and the possibility of obtaining indefinite results, thereby decreasing the usefulness of the study (Mickenautsch and Berger, 2019; Rajeh and Khayat, 2021). Randomized controlled trials are not always viable, while case reports, case series, and cross-sectional studies are easier, faster, and less expensive to conduct (Rajeh and Khayat, 2021). Our findings showed that systematic reviews represented 6.5 % of the articles, and only 25 % of them included a *meta*-analysis. However, *meta*-analysis is helpful because it increases the statistical power and resolves controversies resulting from conflicting studies (Lee, 2019). No qualitative studies, in which data were collected through participant observation or interviews, were identified. The observed study types reflect the need to improve the quality of scientific papers in terms of their level in the hierarchy of evidence-based dentistry (Poletto and Faraco Junior, 2010).

In this analysis, the most frequent authorship pattern was three authors, and approximately 13.13 % of the articles were solo-authored. In previous studies, an increased number of multi-authored articles has been observed (Baskaran, 2013; Fox and Faver, 1984; Qasim et al., 2021). This could be attributed to collaboration among researchers, institutions, and countries (Fox and Faver, 1984; Qasim et al., 2021). Collaboration may have increased because of the nature of interdisciplinary studies, growing costs of equipment and laboratory facilities, and common research interests among scientists (Baskaran, 2013). We observed few articles with many authors, as most journals currently dissuade this practice to discourage the trend of guest authorship (Qasim et al., 2021). Most of the first authors observed in the current study were Asian (84.3 %), with the highest number of authors originating from Saudi Arabia. Additionally, the authors were primarily academics. This could be due to the fact that academics have a well-established active environment for research, with remarkable sources of funding, and the need to publish for job promotion (Jayaratne and Zwahlen, 2015). Moreover, postgraduate curricula in academic institutes require research projects by students (Hussain et al., 2011). Therefore, more

clinical practitioners should be encouraged to participate in research. The diversity of patients in clinical practice will facilitate hypothesis formation. Furthermore, through multi-centric studies and collaborations, newer institutions will benefit from experienced ones and participate in high-quality research (Marusic, 2003). Among the identified Saudi journals, papers with international collaborations comprised only 14.76 % of the 2574 total published articles. A study conducted by Chen et al. (2021) observed that 32 % of the 100 most cited articles in the field of dentistry from Taiwanese institutions involved international collaboration. Moreover, a bibliometric analysis performed on the *International Dental Journal* by Mayta-Tovalino et al. (2023) found that many of the retrieved articles' authors collaborated internationally (14.76 %). Mayta-Tovalino also found that the US had the highest number of papers and that Germany had the highest impact of 1.48 for 34 publications. Promoting interdisciplinary and international collaboration is critical to translate knowledge between disciplines, institutions, and authors (Archibald et al., 2018; Qasim et al., 2021; Yeung, 2019).

Bibliometric analysis is increasingly used to examine trends and advances in various fields of research. In our assessment of published articles, endodontics and orthodontics exceeded other specialties in terms of the number of publications. This marked increase can be ascribed to the presence of specialized journals for each specialty. Furthermore, only 8 % of the publications included in our study disclosed their funding sources. In a bibliometric analysis of audited dental specialty-related articles in the Medical Journal Armed Forces India (2000–2014), only 19 of 118 articles reported funding (Shamim, 2015). Moreover, only 26 of the top 100 dental articles on COVID-19 published between February 2020 and April 2021 disclosed funding sources, funding was disclosed in 26 articles. (Daltaban and Türker, 2023). The lack of grants is a major impediment to high-quality research, and researchers should be aware of the numerous funding sources available (Patil et al., 2020).

To the best of our knowledge, this is the first bibliometric investigation of Saudi dental journals that offers insights into publication output. This bibliometric analysis has some limitations. First, articles that involved more than one specialty (interdisciplinary articles) were classified under the most relevant specialty. Classifying and exploring these trends in interdisciplinary research can be beneficial. Second, only Saudi dental societies and colleges were searched for dental journals. Other sources could be searched for dental research publications in Saudi Arabia, such as governmental or private hospitals and research centers, to enrich the results and make them more comprehensive.

5. Conclusion

The research output of Saudi dental journals was produced mainly by academics and mostly involved collaboration at the national level. There are a limited number of funded studies and studies with high levels of evidence. We recommend promoting the publication of studies with a high level of evidence, enhancing collaboration with international institutions, and encouraging the involvement of practitioners in hospitals and private practices. The current study can be of value to editors and publishers of future research.

Ethical statement

Ethical approval was obtained from the institutional review board of Princess Nourah Bint Abdulrahman University. IRB Number (21-0523).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sdentj.2024.07.008.

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