Systematic Reviews in Dental Research: A Bibliometric Analysis of Contribution from Indian Dentists During 1948–2022

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Aims and Objective: Although systematic reviews (SRs) are the backbone of evidence-based dentistry, they have appeared infrequently in dental literature and their importance may not be recognized by dentists. So, this study aimed to identify SRs in dental research contributed by Indian dentists to the PubMed database during 1948–2022 and describes their epidemiological and descriptive characteristics.

Materials and Methods: An electronic search of the PubMed database was performed from 1948 through September 2022. SRs were considered for inclusion if they were related to oral health and published by Indian dentists as the first author. From this collection, the following characteristics of SRs were described: name of the journal, type of journal (e.g., general dentistry, specialty dentistry, non-dental), year of publication, author’s affiliation, and focus of the SR.

Results: The search identified 439 SRs in dentistry indexed in the PubMed database during 1948–2022. There were only 5 SRs published from 2007 to 2010 with maximum publications during the year 2021 (n = 114; 25.97%). About 32.35% of the SRs (n = 142) were published in 10 journals with the maximum contribution from the Journal of Conservative Dentistry (n = 22; 5.01%). The majority of the SRs were published in the field of Pedodontics and Preventive Dentistry (n = 72; 16.40%), followed by Conservative Dentistry and Endodontics (n = 63; 14.35%).

Conclusion: The contribution of SRs in dental research from India is small but growing. There is a clear need to improve SRs in dental research qualitatively and quantitatively.

Keywords: Bibliometrics, dental research, evidence-based practice, PubMed database, systematic review

INTRODUCTION

Dental research is progressing at a greater speed worldwide.[1] Within dentistry alone, around 500 journals are publishing over 43,000 research articles a year.[2] Dental research in India also is currently undergoing a rapid transformation.[3,4] India published 1380 research papers related to dentistry during 1999–2008, with an average publication of 138 articles per year. Its cumulative output increased from 289 articles during 1999–2003 to 1091 articles during 2004–2008, showing a growth rate of 277.51%. Correspondingly India’s world ranking in dental research improved from 18th position in 1999 to 9th in 2008 with its global publication share of 2.86% when compared with the USA which tops the list with its share of 24.16%.[5]

In recent years, the interest in systematic reviews (SRs), their production, and their publication has been growing as they became foundational to evidence-based dental
Since the inception of the evidence-based practice approach in dentistry, the number of SRs and meta-analysis has rapidly increased. According to a study, a total of 1188 SRs were published from 1991 through 2012 in oral healthcare research. But in India, the shift toward SRs has been a relatively recent phenomenon, with reviews of this type appearing with ever-increasing frequency during the past decade. PubMed is a commonly used database maintained by the National Center for Biotechnology Information and the National Institute of Health, USA. This database is updated regularly and covers details of millions of life sciences manuscripts. It is the most commonly used search tool for millions of researchers working in health and life sciences.

Bibliometric analysis of SRs is considered to be important for various professional societies, dental researchers, scholarly institutions, and funding organizations to frame policies and take necessary actions. There have been several studies conducted on bibliometric analysis of SRs in medicine and dental research. However, no systematic investigations of this type have yet been published analyzing the contribution of SRs by Indian authors in the dental literature. Hence, the objectives of this study were to: (1) identify all SRs in dental research published by Indian dental researchers until September 2022 and (2) describe their epidemiological and descriptive characteristics. Analysis of research outcomes may help to identify gaps where SRs are limited and direct future developments in the field of evidence-based dental practice.

Materials and Methods

We surveyed the English language literature to characterize the existing SRs in dental research published by Indian authors. The PubMed database was searched up to September 13, 2022. The search strategy was done using keywords such as: (((dentistry) OR oral) OR dental) AND systematic review OR Meta-analysis) AND (“1948/01/01”[PDat]: “2022/09/13”[PDat]) AND India [Affiliation]). The search strategy also includes SRs that were known to the authors but not found in the searches. All SRs, from all types of journals including basic sciences, clinical medical sciences, and dental journals, were included. The following criteria were followed for accumulating the data: (a) first author’s affiliation was only considered for the study. (b) Only Indian institutions were considered for the study. We excluded all reports with no direct relevance to dentistry. All the SRs in dental research published by medical scientists were also excluded from the analysis.

The results of the search strategy were assessed independently by two reviewers, and the full article was retrieved for those meeting the inclusion criteria. Each report meeting the inclusion criteria was then assessed independently by the same reviewers, and discrepancies in the screening of titles/abstracts and full-text articles were resolved through discussion. Expert opinion was invited to attain solidarity when there was disagreement. From this collection, the following were noted down: name of the journal, type of journal (e.g., general dentistry, specialty dentistry, non-dental), year of publication, author’s affiliation, and focus of the SR. Those data that were missing such as improper citation of the name of the institution/department and not a citation of state of origin were labeled as “not mentioned.”

The data collected were entered into Microsoft Excel 2007. Data analysis was performed using IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY, USA). Descriptive analysis was done and presented in the form of tables.

Results

Literature search

As reflected in the PubMed database, 718 potential records were found, including 7 additional records identified through other sources. Figure 1 illustrates the flow diagram of the literature search according to the PRISMA. After removing two duplicate records, through the process of screening, 80 records were excluded on the basis of title/abstract. The remaining 636 full-text articles were retrieved for a more detailed evaluation, of which 197 were excluded and do not meet the inclusion criteria mentioned in the methodology. Finally, 439 records were included in the bibliometric analysis.

Journal characteristics and SRs

A total of 439 SRs were published in 152 journals. Nearly half of the SRs (n = 142; 32.35%) were published in 10 journals with maximum contribution from the Journal of Conservative Dentistry with 22 SRs (5.01%). The remaining 152 journals contributed 297 SRs [Table 1].

Year of publication and SRs

A total of 439 SRs were published by September 2022. Table 2 shows the gradual increase of SRs in dental practice.
research with each year, from 2007 to 2022. No SRs and meta-analysis were published in the PubMed database by Indian dental researchers till 2007. There were only five SRs published from 2007 to 2010 with maximum publications during the year 2021 (n = 114; 25.97%) [Table 2].

Dental specialties and SRs

The majority of the SRs were published in the field of Pedodontics and Preventive Dentistry 72 (16.40%), Conservative Dentistry and Endodontics 63 (14.35%), Public Health Dentistry 57 (12.98%), followed by Prosthodontics 51 (11.62%). Only a small portion of SRs was published in the Department of Orthodontics and Dentofacial Orthopedics 27 (6.15%), Oral Medicine and Radiology 25 (5.69%), followed by Oral and Maxillofacial Surgery 21 (4.78%) [Table 3].

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Figure 1: Flow diagram of literature search according to the PRISMA

Table 1: Systematic reviews published in various journals

| S. no. | Name of the journal                                      | Number (%) of SRs published |
|-------|---------------------------------------------------------|----------------------------|
| 1     | Journal of Conservative Dentistry                      | 22 (5.01%)                 |
| 2     | Journal of Clinical And Diagnostic Research            | 20 (4.56%)                 |
| 3     | Journal of Indian Prosthodontic Society                 | 20 (4.56%)                 |
| 4     | Journal of International Society of Preventive and Community Dentistry | 19 (4.33%)                 |
| 5     | Indian Journal of Dental Research                      | 18 (4.10%)                 |
| 6     | International Journal of Clinical Pediatric Dentistry  | 13 (2.96%)                 |
| 7     | Journal of Indian Society of Periodontology            | 9 (2.05%)                  |
| 8     | Journal of Oral and Maxillofacial Pathology            | 8 (1.82%)                  |
| 9     | Journal of Contemporary Dental Practice                | 8 (1.82%)                  |
| 10    | International Journal of Oral and Maxillofacial Surgery | 5 (1.14%)                  |
| 11    | Other journals (152 journals)                          | 297 (67.65%)               |

Table 2: Year-wise publication of systematic reviews in dental research

| S. no | Year of publication | Number (%) of SRs and meta-analysis |
|-------|---------------------|-------------------------------------|
| 1     | 2007–2010           | 5 (1.14%)                           |
| 2     | 2011                | 5 (1.14%)                           |
| 3     | 2012                | 11 (2.51%)                          |
| 4     | 2013                | 11 (2.51%)                          |
| 5     | 2014                | 24 (5.47%)                          |
| 6     | 2015                | 27 (6.15%)                          |
| 7     | 2016                | 24 (5.47%)                          |
| 8     | 2017                | 25 (5.69%)                          |
| 9     | 2018                | 35 (7.97%)                          |
| 10    | 2019                | 9 (2.05%)                           |
| 11    | 2020                | 65 (14.81%)                         |
| 12    | 2021                | 114 (25.97%)                        |
| 13    |                     |                                     |
| 14    | 2022 (till September 2022) | 84 (19.13%)                     |
A total of 193 dental institutes contributed 439 SRs to the PubMed database by September 2022. Among them, the top 10 institutions together contributed 146 SRs (with a 32.35% share) in the total cumulative research output by India. Of these private practitioners contributed five SRs to dental research. Saveetha Dental College and Hospital, Chennai, Tamil Nadu and Center for Dental Education and Research, AIIMS, New Delhi top the list with 32 publications each (7.29%), followed by Dr. D.Y. Patil Dental College and Hospital, Pimpri, Pune, India (n = 21; 4.78%). The institutions along with their contributions are displayed in Table 4.

**Authors and SRs**

Only 10 authors have contributed more than two SRs. The top three contributors were Nagori 5 (1.14%), Mishra5 (1.14%), and Gondivkar 5 (1.14%) [Table 5].

**Discussion**

To the authors’ knowledge, this is the first bibliometric study to identify and describe the characteristics of SRs in scientific literature published by Indian dentists. As reflected in the PubMed database, India published 439 SRs in dental research until September 2022. This is considered to be a meager contribution from India when compared with the bulk of SRs published every year. Saltaji *et al.* demonstrated that 1188 SRs were published between 1991 and 2012 and the contribution from India was less than 2.1%. According to Bassani *et al.*, India contributed 3% to the global publication share of SRs in dentistry in the PubMed database during the year 2017. The lower share is attributed to the reason that the training in methodological aspects of SRs was moderate among Indian dentists.

The first SR in dental research was published by Holland in a British dental journal (1948) as reflected in the PubMed database. The present study demonstrated

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**Table 3: Contribution of systematic reviews by different dental specialties**

| S. no. | Dental specialty                          | Number (%) of SRs published |
|--------|------------------------------------------|----------------------------|
| 1      | Pedodontics and preventive dentistry     | 72 (16.40%)                |
| 2      | Conservative dentistry and endodontics   | 63 (14.35%)                |
| 3      | Public health dentistry                  | 57 (12.98%)                |
| 4      | Prosthodontics                           | 51 (11.62%)                |
| 5      | Periodontics and implantology            | 47 (10.71%)                |
| 6      | Oral and maxillofacial pathology         | 44 (10.02%)                |
| 7      | Department information is not available  | 32 (7.29%)                 |
| 8      | Orthodontics and dentofacial orthopedics | 27 (6.15%)                 |
| 9      | Oral medicine and radiology              | 25 (5.69%)                 |
| 10     | Oral and maxillofacial surgery           | 21 (4.78%)                 |

**Table 4: The top 10 dental institute’s contributions to systematic reviews**

| S. no. | Name of the institution                                      | Number (%) of SRs and meta-analysis |
|--------|-------------------------------------------------------------|-------------------------------------|
| 1      | Saveetha Dental College and Hospital, Chennai, Tamil Nadu, India | 32 (7.29%)                          |
| 2      | AIIMS, New Delhi                                            | 32 (7.29%)                          |
| 3      | Dr. D.Y. Patil Dental College and Hospital, Pimpri, Pune, India | 21 (4.78%)                          |
| 4      | Manipal College of Dental Sciences, Mangalore, Karnataka, India | 16 (3.64%)                          |
| 5      | Peoples College of Dental Sciences and Research Centre, Bhopal, Madhya Pradesh, India | 11 (2.51%)                          |
| 6      | Sri Ramachandra Dental College, Chennai, Tamil Nadu, India | 10 (2.28%)                          |
| 7      | Narayana Dental College and Hospital, Nellore, Andhra Pradesh, India | 9 (2.05%)                           |
| 8      | K. M. Shah Dental College and Hospital, Vadodara, Gujarat, India | 8 (1.82%)                           |
| 9      | Army Dental Centre (Research and Referral), New Delhi, India | 7 (1.59%)                           |
| 10     | Private dental practitioners                               | 5 (1.14%)                           |

**Table 5: The top 10 contributors of systematic reviews in dental research**

| S. no. | Name of the author | Number (%) of SRs and meta-analysis |
|--------|--------------------|-------------------------------------|
| 1      | Nagori             | 5 (1.14%)                           |
| 2      | Mishra             | 5 (1.14%)                           |
| 3      | Gondivkar          | 5 (1.14%)                           |
| 4      | Gambhir            | 4 (0.91%)                           |
| 5      | Nuvvula            | 3 (0.68%)                           |
| 6      | Gaur               | 3 (0.68%)                           |
| 7      | Shah               | 2 (0.46%)                           |
| 8      | Sansare            | 2 (0.46%)                           |
| 9      | Chaitanya          | 2 (0.46%)                           |
| 10     | Jayaraman          | 2 (0.46%)                           |
no contribution from India from the first publication in 1948 to 2007 to the PubMed database. But, there is a steady increase in the number of SRs since 2007. This phenomenon could be explained by an increase in the number of dental colleges, the growing importance of evidence-based dental practice, and an increase in the number of journals published in India. This tendency may be encouraging for the scientific community, but an increased volume of SRs may not necessarily reflect an improvement in the methodological quality of SRs. Unfortunately, the present bibliometric analysis does lack the qualitative dimension. But many studies surveyed the quality of SRs in dentistry and concluded that SRs are poorly conducted, reported, and/or unnecessary.\textsuperscript{[2,8,14,15]} Dental specialties were ranked according to the proportion of the total published SRs in dental research indexed in PubMed. Departments of Pedodontics and Preventive Dentistry and Conservative Dentistry and Endodontics top the list, whereas Departments of Oral Medicine and Radiology and Oral and Maxillofacial Surgery occupied the bottom. The results were similar to Saltaji \textit{et al.}\textsuperscript{[9]} and were in total contrast to a study by Bassani \textit{et al.},\textsuperscript{[10]} in which Department of Oral and Maxillofacial Surgery accounted for the highest share and public health dentistry at the down. This type of analysis helps in identifying the dental specialties where more SRs are specifically needed.

SRs in dentistry appear to be published more often in specialty journals.\textsuperscript{[6]} Similar results were found in our study with half of the SRs published in dental specialty journals. Of the 439 SRs, 81 papers were published in 4 journals, namely, the \textit{Journal of Conservative Dentistry}, \textit{Journal of Clinical and Diagnostic Research}, \textit{Journal of Indian Prosthodontic Society}, and \textit{Journal of International Society of Preventive and Community Dentistry}. Interestingly, the impact factor and \textit{h} index of the above journals range between 0.27–0.37 and 0–56, respectively, according to Scimago journal rankings. This finding may conclude that SRs in dental research are in a poor state in India, in terms of both quantity and quality.

The top 10 Indian dental institutions together contributed 146 SRs (with a 33.25\% share) in the total cumulative research output during 1948–2022. Of these, the largest numbers of SRs are contributed by Saveetha Dental College and Hospital, Tamil Nadu; AIIMS, New Delhi; and Dr. D.Y. Patil Dental College and Hospital, Pune, India. A similar analysis was done by Kaur to map dental science research in India during 1999–2008. It was identified that the top 25 Indian dental institutions together contributed 874 papers (with a 63.33\% share) in the total cumulative research output.\textsuperscript{[6]}

Based on publications output data for India in dental sciences, only 10 authors were identified as productive publishing more than 2 SRs. Of these, Nagori, Division of Oral and Maxillofacial Surgery, Army Dental Centre (Research and Referral), New Delhi, India tops the list with five contributions. In the present study, 37 SRs were excluded based on the fact that Indian dentist was not the first author of the SR. This reflects the collaborative nature of Indian dentists to conduct SRs as the average share of international collaborative papers published by Indian authors varied from 7.14\% to 37.5\%, with the average share per author during 1999–2008 being 17.5\%.\textsuperscript{[16]}

It's important to consider the limitations of the present study. Bibliometric analysis using only the PubMed database does not cover the entirety of scientific production. However, a similar approach has been successfully used in different studies.\textsuperscript{[17-19]} We used this approach because PubMed is the premier online bibliographic database that is freely accessible and covers all the fields such as medicine, nursing, dentistry, veterinary medicine, healthcare system, and the preclinical sciences. Moreover, as per the norms of state health departments in India, the academic progress of faculty/researchers depends on publication output in the PubMed database. Finally, this analysis suffers from the disadvantage of being quantitative and not qualitative. So other methods need to seek how bibliometric analyses can be used further to evaluate the quality of SRs.

\section*{Conclusions}

To conclude, the poor contribution of Indian dentists to SRs indexed in the PubMed database was identified during 1948–2007, but there is a radical increase in the number of SRs from 2007 to 2022. The epidemiological and descriptive characteristics of SRs in dental research varied among different journals, dental specialties, and institutes. Based on this, there is a clear need for the improvement of SRs in dental research both qualitatively and quantitatively.

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\section*{Conflicts of interest}

The authors declare no conflicts of interest.

\section*{Authors’ contributions}

Gadde Praveen: Conceptualization, literature search, methodology, data analysis and interpretation, draft writing, review & editing. Mohan Kumar Pasupuleti: Methodology, data analysis, draft writing, review
& editing. Gautami S. Penmetsa: Methodology, draft writing, review & editing. Haribabu Nagisetti: Methodology, draft writing, review & editing.

Sailakshmi Durga Indukuri: Draft writing, review & editing. Anitha Akkaloori: Draft writing, review & editing.

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