Periodontitis and Low Bone Mineral Density: A Bibliometric Study of the Top 100 cited Articles

Aastha Baldodia, Rajinder Kumar Sharma, Shikha Tewari, Aman Arora, and Muskan Baldodia

ABSTRACT

Purpose: Science mapping is commonly known as Scientometrics; is used in combination with data visualization to analyze a considerable form of bibliographic resources to study and map the scientific field and thereby serving investigators to concentrate on under investigated areas of research. This scientometric study was aimed: 1) to evaluate the level of investigation in the field of periodontitis and osteoporosis, and 2) to recognize the journals, and countries in this field.

Methods: The top hundred articles with most citations were selected by electronic searches in the MEDLINE database, and the citations were cross checked by Google Scholar database. The total number of publications per year along with their yearly growth was calculated. The following data regarding the journal, country of origin, and level of evidence were analysed.

Results: 467 authors within 77 clusters contributed to these 100 articles. The annual rate of growth of publications in the period from 2011 to 2020 was 6.27%. The year range of these publications started from 1992 till 2019, the second decade of the new millennium showed the highest number of articles (39 out of 100 articles).

Conclusion: Though the number of articles published on the present topic has risen in the last two decades, the proportion of studies with LOE1 is as low as 5%. Therefore, recommendations are made to the researchers to lay emphasis on producing more studies with LOE1 in future.

Keywords: osteoporosis; periodontitis; periodontal-systemic disease interactions.

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I. Introduction

Bibliometric scan be defined as statistical analyses of literature, revealing the historical development of the concerned field, pattern of authorship, publication, and use [1].Determining the incidence of the publication to be cited by other authors in other publication articles, is a frequently used method for assessing the academic importance and quality of an article [2]. It is also believed that the sum total of citations of an article may inherit the ability to bring changes in clinical practice, and further

Research [3]. A significant correlation is seen between other indices of scientific recognition and citation analyses in specific fields of knowledge [4]. Therefore, this resource has become highly popular for the measurement of effectiveness of higher citations of an article, a journal, an author, a speciality, or a country [5].

Periodontitis is an infectious-inflammatory disease of the supporting tissues of the teeth, and many systemic factors responsible in its progression through various interactions between the infectious agents and the host. It is affected by genetics, gender, smoking, inflammation, and osteoporosis

Osteoporosis is a systemic disease owing to micro architectural deterioration of bone tissue leading to low bone mineral density. Numerous studies on association of osteoporosis and periodontal disease have been documented [7]. Bone loss has been an obvious common feature of both the diseases [8].

Several bibliometric studies in various fields of biomedical research determining attributes of most cited articles and registering information regarding journals, topics, and authors [9]. There are few bibliometric studies conducted in Periodontics [10]. Systematic reviews on the association of periodontitis and osteoporosis are published recently. No bibliometric/Scientometric studies have been published till now [11]. This scientometric study was aimed:

- To evaluate the level of investigation in the field of periodontitis and osteoporosis, and
 - To recognize the primarily journals, and countries in

this field.

II. MATERIALS AND METHODS

A. Data Search

The top hundred articles with most citations were selected by electronic searches in the MEDLINE database, and the citations were cross checked by Google Scholar database. The following keywords were used:

- 1. periodontal attachment loss/ periodontitis/ chronic periodontitis;
 - 2. bone density/osteoporosis.

All possible combinations of 1 and 2 were done, to maximize of search in order to detect every correlated article until December 2020.

The search was performed on 22nd January 2021. The selected documents from the retrieved data included original research articles, review articles and case reports. In vivo and in vitro studies were eliminated. The result was arranged in the ascending order of the maximum citations an article received. After reviewing of the top 135 articles, a text and an .NBIB file were prepared. Every article was reviewed and further information regarding the authorship, study design, journal, and country of origin were collected. The data was recorded using Microsoft excel. A manual review was done so that any duplication, unrelated article can be excluded. The top hundred articles with most citations were selected after the final review. A further manual edits of the database removed any typographic and indexing errors if present, and then the author normalization was done. The evaluators established the type of study, along with analyzing the journal of the published article, number of authors, country of origin, and topic. The ranking system taken for determining level of evidence was as follows[12]:

LOE 1: Systematic reviews, and controlled clinical trials (Randomized);

LOE 2: Cohort studies:

LOE 3: Case control, and cross-sectional studies;

LOE 4: Case series;

LOE 5: Case reports.

B. Publication Metrics

The number of published articles year wise and the annual growth rate of articles from 1992 to 2020 were calculated. The annual growth rate of publications was analysed by deducting the total number of publications (past year) from the total number of publications (present year), and then dividing by the number of publications (past year). The final output was multiplied by 100. The average growth rate of publications between 2011 and 2020 was computed[13].

III. RESULTS

A. Publication Metrics

The highest number of articles was published in 2017 (Fig.1). The annual rate of growth of publications (2011-2020) comes out to be 6.27%. There was marked variations in the annual rate of publications, with the highest achieved

for year 2010 (increased from 0 to 7).

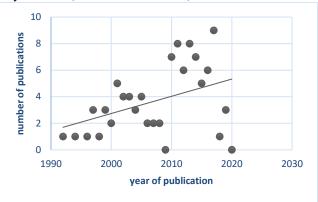


Fig. 1. Scatter graph showing the number of the top most cited articles published per year.

The year range of these publications started from 1992 till 2019, the second decade of the new millennium showed the highest number of articles (39 out of 100 articles). Top 5 publication based on the highest number of publications is shown in (Fig. 2).

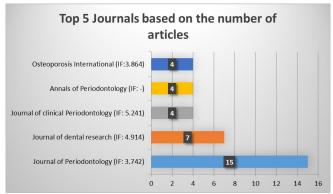


Fig. 2. The Top five journals based on the number of published articles.

Country was decided by the origin of the first author of these articles. Maximum citations were 3787 gained by United States followed by Japan with 650 citations. The allocation of articles according to the study design ranging from level of evidence 1-5 is shown in the (Fig. 3).

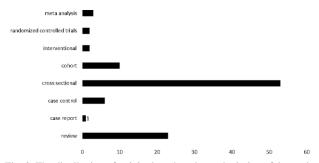


Fig. 3. The distribution of articles based on the study design of the study.

IV. DISCUSSION

This is the first bibliometric study in the field of "periodontitis and low bone mineral density". It is believed that if a publication appears in top 100 most cited articles in any field, it has marked a milestone. The qualitative nature of the article is perceived by the recognition it has received

from the scientific community and its ability to bring about a change in clinical practice and activating research in new directions.

The number of citations an article gained ranges from 503 to 3, with the mean of 74.43. The article with the maximum citations was published in year 2000. Out of 100 articles, 9 articles had been cited for more than 200 times indicating high scientific impact. As older works received more citations because of the fact that these articles have been available longer; estimating the number of citations per year may provide important information. On placing the articles according to the yearly total citations, three articles resurfaced exhibiting more than 20 citations per year. The first article remains the same as the topmost cited article receiving 25.15 citations per year followed by the article in 2006 with 24.85 citations, and a recent article published in 2017 with the remarkable 20.66 citations per year. These articles were published from 1992 to 2019, with nearly 2/3rd (66 articles) published after the year 2000. The new recent articles receiving high citations may be attributed to the increasing number of articles since the year 2000. More than 50 scientific journals have been involved in the publication of these 100 articles. It is pertinent to note that many of the journals are not related to Periodontics or other dental specializations, namely "Gerodontology", "Menopause", "Osteoporosis International" and other esteemed journals. This shows mutual interdisciplinary interests to explore the nature of association between low bone mineral density and periodontitis.

The journal of periodontology (JOP) and Journal of Dental research have published the maximum number of articles in the field of "periodontitis and low bone mineral density". It should also be noted that JOP received the maximum citations among other journals. One of the 2 randomized control trials (LOE 1) in these top most cited articles is also published in JOP. This reflects the magnitude of contribution in the exploration and evolution of association between low bone mineral density and periodontitis.

The authors of these 100 top cited articles belong to 25 different countries. Authors from United States have acted as a significant part in the scientific growth in the field of "periodontitis and low bone mineral density". More than one-fourth articles (28) are by the authors based in the United States. Moreover, these studies received the highest total citations (3787). In terms of average number of citations per article, Denmark received the highest number (395 citations). The articles under LOE1 were mainly from United States, Spain, Brazil, and India. A relatively low relative level of evidence in the field of "periodontitis and low bone mineral density" is noted. A meagre 5 percent of articles account for LOE1. Almost 60% of all the publications come under LOE3.

However, there can be a considerable debate over the significance of citations to determine the qualitative properties of an article [15]. Temporal bias may occur with respect to citation analysis; as an article gains citations with time but with the imbibition of the content into the present knowledge, citation rate may decrease gradually. Secondly, self-citation may cause potential bias in bibliometric analysis. This inadequacy acknowledged by various authors is the basis of debate over relevance of considering selfcitations [10,16]. It is also pertinent to note that all the articles are derived from the PubMed search engine that access primarily the MEDLINE database for sciences and biomedical topics. Other search engines have not been consulted, although all the citations were counterchecked on Google Scholar. Articles indexed in different databases, or any thesis paper may have been missing in the list.

TABLE I: THE COUNTRIES OF ORIGIN OF THE AUTHORS OF THE TOP 100 CITED ARTICLES

Country	No. of articles	Citations	Citations/article
United States	28	3787	135.25
Japan	11	650	59.09
Sweden	3	512	170.60
Denmark	1	395	395.00
India	14	370	26.42
Netherlands	1	273	273.00
China	7	218	31.14
Spain	3	216	72.00
Brazil	8	207	25.87
Iran	2	114	57.00
Turkey	3	111	37.00
Jordan	1	89	89.00
Korea	3	71	23.66
Lithuania	1	62	62.00
Australia	1	59	59.00
Greece	1	57	57.00
Mexico	2	50	25.00
Chile	1	25	25.00
Croatia	1	18	18.00
Slovakia	1	18	18.00
Taiwan	1	13	13.00
Poland	1	9	09.00
Israel	1	8	08.00
Saudi Arabia	1	7	07.00
Thailand	1	3	03.00

In conclusion, this scientometric study provided scientific information, and progress towards finding association of periodontitis and low bone mineral density. The top hundred articles with most citations are published in over 50 PubMed indexed journals. The average yearly growth rate of publications was 6.27% from 2011 to 2020, with the maximum yearly rate in the year 2010, and highest number of articles in 2017. The Journal of Periodontology remains the lead journal regarding the number of articles published, as well as gaining the highest citations. Authors from United States leads in term of producing more than one-fourth articles (28 out of 100) appeared in the list. Though the number of articles published have risen in the last two decades, the proportion of studies with LOE1 is as low as 5%. Therefore, recommendations are made to the researchers to lay emphasis on producing more studies with LOE1 in future.

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CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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