

A Bibliometric Perspective on the Relationship between Periodontal Disease and Gestational Diabetes

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ABSTRACT

Aim: To analyze the bibliometric indicators of the world scientific production on periodontal disease and gestational diabetes.

Materials and methods: Bibliometric study in which a search strategy was designed with logical operators and MESH terms. After the search and application of selection criteria, 83 articles were included. SciVal, VOSviewer, and the Bibliometrix module of R Studio were used to analyze the metadata.

Results: From 2012 to 2021, there is evidence of an increase in scientific dissemination on gestational diabetes and periodontal disease, especially in high-impact journals (79.2%). SUNY Buffalo (6), United State University, and Ege University, Turkey (5) are the most productive; however, the one that received more citations than the global average was the University of Birmingham (FWCI: 5.59). In addition, the United States, Brazil, and India were the most influential countries; while, Graziani F, Akcali A, and Buduneli N, were the most representative authors. The Journal of Periodontology and the Journal of Clinical Periodontology published the most articles, with 13 and 6, respectively.

Conclusions: The scientific production on periodontal disease and gestational diabetes is higher in recent years, with a better proportion of articles in high-impact journals. In addition, the United States concentrates many publications, and the activity of Chilean institutions stands out.

Clinical significance: The clinical significance of this study lies in its capacity to synthesize the currently available published information regarding the correlation between periodontal disease and gestational diabetes. This study enables researchers and clinicians to ascertain the current level of knowledge on this subject.

Keywords: Bibliometric analysis, Bibliometrix, Diabetes gestational, Periodontal diseases.

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INTRODUCTION

During pregnancy, physiological, hormonal, and nutritional changes occur that contribute to a greater predisposition and evolution of oral diseases.¹ Inadequate oral hygiene and the accumulation of bacterial plaque further increase the probability of periodontal disease,^{2,3} which is characterized by bacterial inflammation in the gingival tissue, which progresses and affects the oral support tissues, and which also represents one of the most frequent and neglected problems during pregnancy.^{4,5}

Gestational diabetes is considered an important public health problem due to its impact on maternal health status and quality of life.⁶ The conditions of this disease can lead to severe periodontitis problems; and in turn, generate systemic responses that derive or worsen the state of hyperglycemia in women. Thus, it is recognized that both diabetes and periodontitis are mutually affected, aggravating the consequences of each disease.^{7,8}

Current literature has shown that periodontal disease is associated with the appearance of some pathologies, including gestational diabetes mellitus.⁹ In this regard, there is evidence of an increased risk of dysglycemia, insulin resistance and higher glycosylated hemoglobin values in people with periodontitis.¹⁰ In fact, Han Yao et al.¹¹ concluded that pregnant women with diabetes mellitus had a higher rate of detection in the number of oral bacteria compared with non-diabetic pregnant women.

The prevention and management of these diseases are necessary actions during the gestational period, so prenatal care and dental consultations are strategic services within a comprehensive care package. However, despite their relevance, the use of dental services is infrequent, and they are generally used for the recovery of dental problems and not for prevention.¹²

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Gestational diabetes, a disorder that typically affects approximately 15% of the pregnant women, is characterized by an imbalance in glucose metabolism.³ The molecular mechanisms affected in this association involve an elevated release of cytokines and insulin resistance. Both gestational diabetes and periodontitis can result in complications such as premature delivery and macrosomia. Additionally, periodontitis increases the risk of cardiovascular disease, pregnancy complications, and difficulties in diabetes control, among other factors. Therefore, bibliometric analysis could allow us to better understand this relationship. In this way, strategies for the treatment of pregnant women with diabetes could be implemented.²⁻¹⁰ Periodontal disease has been linked to various medical conditions, such as cardiovascular disease, stroke,

diabetes, and negative pregnancy outcomes. This association is likely due to systemic inflammatory processes. It is prevalent among women of reproductive age, and gum conditions tend to exacerbate during pregnancy. Observational studies have hinted at the potential of periodontal intervention in mitigating adverse pregnancy outcomes. Nonetheless, a thorough Cochrane review of randomized trials is warranted to thoroughly evaluate the impact of periodontal treatment on maternal and perinatal well-being.¹² The risk of cardiovascular disease was significantly higher in patients with periodontal disease compared with those without [RR: 1.20; 95% CI: 1.14–1.26] and the risk of coronary heart disease was also increased (RR = 1.14; 95% CI: 1.08–1.21).¹³

Scientific activity on the link between these two diseases affecting a pregnant woman is increasing. New approaches and horizons are emerging from the development of research to guide the professional work of dental health personnel and maternal health specialists. In this regard, the development of a bibliometric study can contribute to this scenario, since this type of research allows exploring and analyzing the existing literature in a field of knowledge to evaluate its impact, visibility, trends, and collaboration in the scientific community.^{2–7}

Thus, this study aims to analyze the bibliometric indicators of the worldwide scientific production on periodontal disease and gestational diabetes.

MATERIALS AND METHODS

Study Design

A descriptive, retrospective, cross-sectional study with a bibliometric approach was carried out. The metadata of the articles that were downloaded from Scopus were used.

Source of Data

Bibliometric study that analyzed a set of data obtained from Scopus, which has high-impact indexed scientific publications in different fields of science. For this purpose, a search formula was elaborated with the thesauri obtained from MESH (Medical subject heading) of PubMed and through the Emtree terms of the Embase database.

Search Strategy

Based on MESH terms and Boolean operators, a search strategy was developed, which was limited to the title, abstract and keywords, and was established as follows: TITLE-ABS-KEY (("Periodontal Diseases" OR "Periodontal Diseases" OR "Periodontal Disease" OR "Parodontosis" OR "Parodontoses" OR "Gum Disease" OR "Oral Health" OR "Pyorrhea Alveolaris" OR "Periodontitis" OR "Gingivitis") AND ("Diabetes Gestational" OR "Diabetes Pregnancy- Induced" OR "Diabetes Pregnancy Induced" OR "Pregnancy-Induced Diabetes" OR "Gestational Diabetes" OR "Diabetes Mellitus Gestational" OR "Gestational Diabetes Mellitus")) AND PUBYEAR >2011 AND PUBYEAR <2022. The search was performed in Scopus on May 7, 2023.

Study Selection

The following criteria were considered for inclusion of publications: (1) studies related to gestational diabetes and periodontal disease, (2) all identified publication types, (3) any language, and (4) published between 2012 and 2021. After application of the criteria, 83 articles were included, whose metadata were downloaded on the same day of the search.

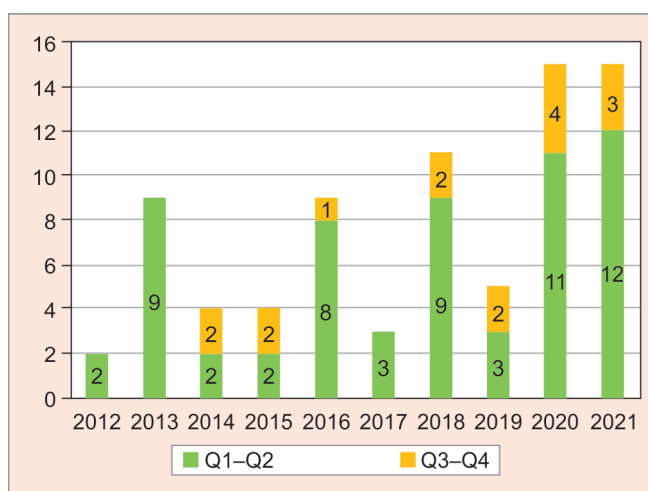


Fig. 1: Evolution of scientific production on periodontal disease and gestational diabetes

Data Analysis

The reporting of bibliometric parameters were performed with the SciVal tool, which interoperates directly with the Scopus database. The indicators for the analysis of institutions and scientific journals were number of publications, citations per published paper, Field-Weighted Citation Impact, CiteScore 2021, Source-Normalized Impact per Paper, quartile, and country. A bar chart was designed using Excel to show the trend of scientific productivity. The Bibliometrix module of the R Studio software version 4.2.3 was used to design the collaboration and Three-Field Plot graphs. VOSviewer version 1.6.19 was used to visualize co-authorship by country.

RESULTS

In this study, there was no collaboration with other countries to analyze the data. From 2012 to 2021, there is evidence of an increase in scientific dissemination on gestational diabetes and periodontal disease, with less preference for scientific journals in the Q3 and Q4 quartile. Most of the articles are published in high-impact journals (79.2%) (Fig. 1).

Universities from different countries lead the scientific production, among them, the most productive were SUNY Buffalo (6) from the United States and Ege University from Turkey (5); however, those that received more citations than the global average were the University of Birmingham (FWCI: 5.59) from the United Kingdom and the University of Pisa (FWCI: 5.71) from Italy. The collaboration of Chilean institutions, such as the *Universidad de Chile* and the *Universidad de los Andes Chile*, both with 16 publications, stands out. It is also important to note that SUNY Buffalo was the institution with the highest number of citations per publication (180.5 citations), while the University of Helsinki received only 10.3 citations per publication (Table 1).

The Q1 and Q2 quartile journals lead the productivity ranking, of which the Journal of Periodontology (Q1) has published the most on gestational diabetes and periodontal disease, followed by the Journal of Clinical Periodontology (Q1), with 13 and 6 publications, respectively. Periodontology 2000 has the best CiteScore 2021 (15.9) and Source-Normalized Impact per Paper (3.919). In addition, the Journal of Applied Oral Science, from Brazil, is one of the journals with the most citations to publications (24.3). It is also noteworthy

Table 1: Top 10 institutions with the highest scientific production on periodontal disease and gestational diabetes

<i>Institution</i>	<i>Scholarly output</i>	<i>Citations per publication</i>	<i>Field-weighted citation impact</i>	<i>Country</i>
SUNY Buffalo	6	180.5	2.56	United States
Ege University	5	16	0.69	Turkey
University of Birmingham	4	231.8	5.59	United Kingdom
University of Pisa	4	161.3	5.71	Italy
Tulane University	4	18.3	0.97	United States
University of Michigan, Ann Arbor	4	118.5	1.9	United States
Universidad de Chile	4	16	1.47	Chile
Universidad de los Andes Chile	4	16	1.47	Chile
University of Helsinki	3	10.3	1.31	Finland
University of Eastern Finland	3	120	1.55	Finland

Table 2: Top 10 journals on periodontal disease and gestational diabetes scientific production

<i>Scopus source</i>	<i>CiteScore 2021</i>	<i>Source-normalized impact per paper</i>	<i>Citations per publication</i>	<i>Scholarly output</i>	<i>Quartile</i>	<i>Country</i>
Journal of Periodontology	10.5	1.746	36.7	13	Q1	United States
Journal of Clinical Periodontology	13.5	3.45	191.8	6	Q1	Denmark
Journal of Applied Oral Science	4.8	1.517	24.3	3	Q1	Brazil
Periodontology 2000	15.9	3.919	91	2	Q1	Denmark
Diabetes Research and Clinical Practice	9.5	2.145	68.5	2	Q1	Ireland
Indian Journal of Dental Research	3.2	0.793	6.5	2	Q3	India
Journal of Public Health Dentistry	3.4	0.969	13	2	Q2	United States
Journal of Maternal-Fetal and Neonatal Medicine	4	1.03	13	2	Q2	United Kingdom
International Journal of Environmental Research and Public Health	4.5	1.44	8.5	2	Q2	Switzerland
Current Oral Health Reports	2.8	0.654	7	2	Q2	Netherlands

that the Journal of Clinical Periodontology had the highest average number of citations per publication with 191.8 citations, while Current Oral Health Reports only had a weighted average of seven citations per publication. (Table 2).

The representation of co-authorship by country in the publications shows that the United States and India are the countries with the highest frequency of publications and collaboration between them. The United Kingdom and Finland led one of the three clusters identified and were also countries with a strong link to U.S. publications (Fig. 2A).

The United States, Brazil, and India were the most influential countries, while the main journals for dissemination were the Journal of Periodontology, Journal of Clinical Periodontology, and Diabetes Research and Clinical Practice. In addition, Graziani F, Akcali A, and Buduneli N, were the most representative authors of the scientific production on periodontal disease and gestational diabetes (Fig. 2B).

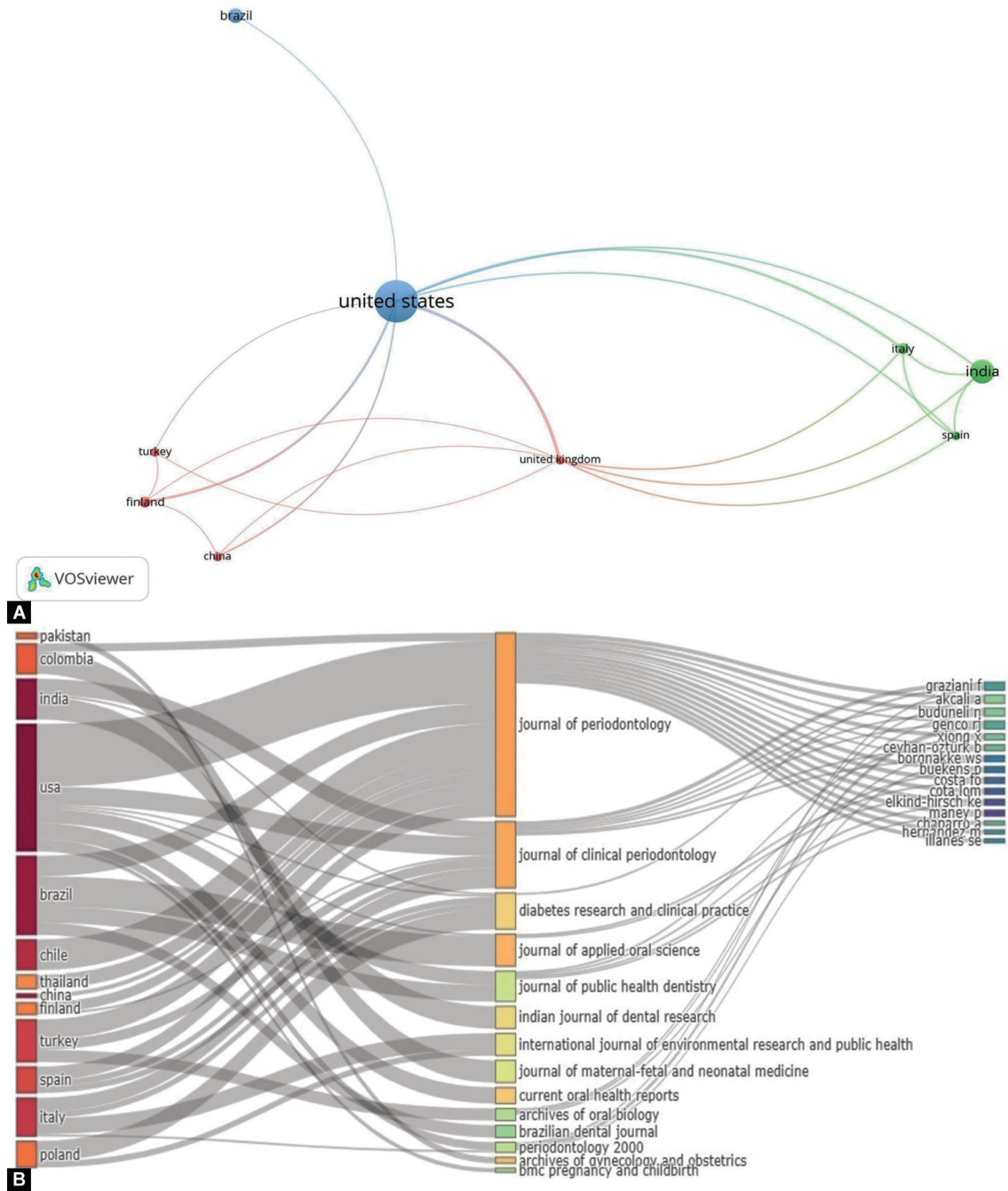
DISCUSSION

It is now known that the risk of gestational diabetes mellitus increases with the presence of periodontitis.¹⁴ Therefore, in recent years, interest in this problem has become more prominent with the development of research that addresses it; and, together with

this, the need to strengthen the competencies of both medical specialists and dentists in the approach to diabetic patients, especially during pregnancy, has become evident.¹⁵

The preference for the research topic of this study, and consequently, its publication in scientific journals has increased over the years. Although each regional context may have its own interests according to the public health problems they present, a study that described the production on gestational diabetes in Southeast Asia concludes that this scientific evidence has increased,¹⁶ with pregnancy outcomes being a specific content of this group of research. Therefore, it is necessary to articulate and unify efforts to produce comprehensive and wide coverage research to generate evidence to implement interventions on gestational diabetes and its impact on oral health according to each local reality.

The United States is one of the countries that generates the greatest scientific production in the world; in fact, a study that explored the most cited scientific literature on gestational diabetes showed that most of the articles came from the United States;¹⁷ also, this country led the ranking of the most representative countries on the subject of oral health in pregnancy.¹⁸ The findings of this study, which analyzes the manuscripts on periodontal disease and gestational diabetes, position the United States as an influential, decisive, and leading player in this field of knowledge, as reported in the study by Gao et al.¹⁹



Figs 2A and B: (A) Co-authorship by country in scientific production on periodontal disease and gestational diabetes; (B) Three-field plot

Collaboration represents a relevant strategy for the development of science since it allows the generation of networks of authors and institutions. However, a previous study found that international cooperation was rare in the scientific production on periodontal disease associated with gestational diabetes, highlighting the work of Columbia University, and like our analysis, identifies SUNY Buffalo and the University of Michigan as one of the most productive.¹⁹

The bibliometric exploration carried out allows proposing new research horizons and strengthening existing ones, especially those oriented to the prevention and timely diagnosis of oral diseases in the population of diabetic pregnant women, especially if it is taken into account that in a bibliometric research, it was reported

that the areas of occupational and environmental public health still need to be deepened and explored.¹⁹ Thus, studies should be developed based on interventions to improve the oral health status of pregnant women, and that are not only focused on knowledge about the state of their oral health.²⁰

As limitations of this study, it has been considered that there may be errors in the metadata of the manuscripts analyzed or loss of indexing of some journals, although these are biases inherent to bibliometric studies, it is important to recognize that the estimation of bibliometric indicators is based on the information available during the export with SciVal. We can add that only one database, Scopus, has been consulted, so it is

necessary for future researchers to integrate new search engines to globally characterize the production on periodontal disease and gestational diabetes. The lack of collaborative research among other universities and/or countries was a limitation in this study. Although collaborative research is fundamental to advance scientific knowledge, the present study was conducted independently. Future studies should encourage collaborative efforts to enhance the quality and generalizability of the findings. However, the strength of this study is that it provides an overview of the scientific activity on this topic, which, unlike a review, allows us to determine patterns of trend, productivity, or impact of scientific production.

CONCLUSION

Scientific productivity on periodontal disease and gestational diabetes has increased, with a higher proportion in high-impact journals (Q1 and Q2). The United States concentrates many publications and has strong collaborative links with India, Finland, and the United Kingdom, in addition, the active role of Latin American universities, such as the University of Chile and the University of the Andes (Chile), should be highlighted.

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