ANALYSIS OF BIBLIOMETRIC STUDIES IN THE FIELD OF STOMATOLOGY: A META BIBLIOMETRIC APPROACH

Análisis de estudios bibliométricos en el campo de la estomatología: una aproximación metabibliométrica

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ABSTRACT

Objectivo: The objective of the present study was to analyze the characteristics of scientific production and thematic synthesis of bibliometric studies in the field of stomatology.

Materials and Methods: A bibliometric method was followed to analyze studies under the same methodology in three specialized databases: Scopus (n=160), Web of Science (n=107) and Pubmed (85) where 352 articles were obtained which were reduced by the presence of duplicates (n=160), incorrect language (n=2) and gray literature (n=6), a final sample of 184 bibliometric articles was obtained for the analysis.

Results: The most relevant results were: 4.06% annual increase in scientific production from 2000 - 2022, predominance of Brazilian and Chinese institutions in the production of bibliometric articles, higher percentage of journals indexed in Q1 as sources of bibliometric analysis. Likewise, three driving thematic lines were identified: "Endodontic procedures in children and adolescents", "Dental education and stomatological bibliometrics" and "Evidence of orthodontic application", peripheral thematic lines such as "Bibliometric indicators applied to stomatology" as an emerging topic and "Scientific production in the stomatological field" as a declining topic.

Conclusion: There was a significant increase in scientific production during the health crisis and the countries that carried out health reforms had greater scientific production.

Keywords: Bibliometric Indicators; Oral Medicine; Dentistry; Science, Technology and Innovation Indicators; Education, Dental; Methodology as a Subject.

RESUMEN

Objetivo: El objetivo del presente estudio fue analizar las características de la producción científica y síntesis temática de estudios bibliométricos en el área de estomatología.

Materiales y métodos: Se siguió un método bibliométrico para analizar estudios bajo la misma metodología en tres bases de datos especializadas: Scopus (n=160), Web of Science (n=107) y Pubmed (85) donde se obtuvieron 352 artículos los cuales fueron reducidos por la presencia de duplicados (n=160), lenguaje incorrecto (n=2) y literatura gris (n=6), se obtuvo una muestra final de 184 artículos bibliométricos para el análisis.

Resultado: Los resultados más relevantes fueron: 4,06% de incremento anual en la producción científica de 2000 – 2022, predominio de instituciones brasileñas y chinas en la producción de artículos bibliométricos, mayor porcentaje de revistas indexadas en el primer trimestre como fuentes de análisis bibliométrico. Asimismo, se identificaron tres líneas temáticas impulsoras: "Procedimientos endodónticos en niños y adolescentes", "Educación odontológica y bibliometría estomatológica" y "Evidencias de aplicación en ortodoncia", líneas temáticas periféricas como "Indicadores bibliométricos aplicados a la estomatología" como tema emergente y "Producción científica en el ámbito estomatológico" como tema en declive.

Conclusión: Hubo un aumento significativo de la producción científica durante la crisis sanitaria y los países que realizaron reformas sanitarias tuvieron mayor producción científica.

Palabras Clave: Bibliometría; Medicina Oral; Odontología; Indicadores de Ciencia, Tecnología e Innovación; Educación en Odontología; Metodología como un Tema.

INTRODUCTION

Scientific research is the guiding component of knowledge circumscribed to a disciplinary field because it provides the explanatory mechanisms, theoretical scope and allows solutions to specific problems in society.[1] For this reason, training institutions have aimed to develop competent professionals in the analysis and explanation of the behaviour of their object of study based on research methodology.[2]

However, its relevance has manifested itself with greater impact in the last two decades as health, economic, social and educational crises have challenged all professionals from different disciplines to investigate the effects of crisis scenarios from their scientific perspective.[3,4]

In this two-decade panorama, a substantial increase in research has been observed in multiple fields of knowledge,[5] especially in the health disciplines.[6] Faced with the considerable increase in scientific information in the area of health, methods have been proposed to manage, synthesise and contrast the findings, among which systematic reviews, meta-analysis studies and bibliometric analyses could be highlighted. Although the aforementioned methods have the same function:

to synthesise a vast body of research, the divergence lies in the conclusions that are drawn. In the case of systematic reviews, three scenarios could be inferred: clustering topics, critical content analysis, and evaluated system performance.[7,8] On the other hand, meta-analysis studies have fixed or mixed effects as outcomes based on effect sizes of the included studies.[9,10] In both cases, homogeneity between studies is a crucial

element that allows conclusions to be drawn with a greater or lesser degree of certainty.[11] In the third group of methods, there are more notable differences with respect to the treatment of the data and the inferences of their findings, given that they aim to quantify the processes of communication and dissemination of scientific articles.[12]

in order to obtain an accurate synthesis and evaluation of the scientific state of the discipline, and to obtain a consistent measure of the impact of institutions, academic journals and authors in the health disciplines.[13] In the health field, bibliometric analysis clarifies conceptual boundaries, describes advances in the discipline, properties of findings such as obsolescence and disse-mination, fluctuations in lines of research, and collaborative engagement among networks of researchers.[14]

However, the relevance of bibliometric studies transcends the discipline and they constitute efficient tools to provide evidence for governmental decision-making for the establishment of public policies and latent impulses in research activity in a nation, institution and/or professional discipline.
In the field of stomatology, the bibliometric method strengthens and increases knowledge about evidence-based practices to the extent that it establishes a compilation framework of findings to assess the effectiveness and efficiency of procedures, and to provide follow-up recommendations on the scientific journals with the greatest production and relevance for the disciplinary community.[15]

For this reason, in the last decade a significant body of studies has been developed to evaluate the scientific production in the

stomatological field, of which analyses can be detected according to specialised,[15,16] institutional[17,18] and thematic[19] databases. Surrounding bibliometric studies, there are two differentiating characteristics: temporality and delimitation.

The temporality allows the analysis of documents to be limited to a relatively stable period of science, although it is directly influenced by the health policies of nations, whether it is a reduction in the economic resources allocated to research and/or changes in the regulations for carrying out studies. In complementarity, the spatial delimitation of the bibliometric analysis allows to establish the scope of the inferences made in the thematic fields and scientific production.

However, few studies have evaluated the thematic characteristics of scientific production, and consequently there is a theoretical vacuum in the conceptual grouping of the discipline. In addition, there is little information regarding the thematic trends and scientific production of bibliometric research in the field of stomatology.
Therefore, the aim of the present study was to analyse the characteristics of scientific production and thematic synthesis of bibliometric studies in the field of stomatology.

MATERIALS AND METHODS

It was based on bibliometric methodology as it analyses the scientific literature using quantitative techniques to identify thematic characteristics and the identification of scientific production according to references and bibliographies.[20,21]

Furthermore, the sources of information are restricted to bibliometric studies, the present study adopted a meta-bibliometric approach.

Accordingly, the documents were extracted from the specialised database *Scopus, Web Of Science* and *Pubmed* during the period 31 January to 01 February 2023. Thus, the selection criteria developed to include and exclude the articles in Table 1 were as follows.

Search strategies were also used for the article extraction process. The Boolean algorithm used was the keyword "bibliometric" identified in the category "dentistry" (Table 2). Subsequently, duplicates of the records identified in the databases were detected and eliminated using the bibliometrix function package[22] of the statistical software R. The records were then combined to obtain a unified database and transferred to the bibliometric analysis interface to identify the indicators of authorial production.

On the other hand, to identify thematic trends, we used networks of keyword concurrences represented by nodes whose interrelationship is mediated by edges that allow us to characterise the intensity, direction, stability and precision of the indices,[23] consequently, the "Leiden" clustering algorithm was used due to its robustness and methodological power to detect keyword communities.[24] Likewise, Porter's derivation algorithm[25] was used to suppress the effect of gender, number or person.

To localise the incidence of topics, a strategic diagram was established in thematic fields segmented according to their keyword density and centrality as measures of impact and relevance, respectively,[26] composed of basic,

driving, specialised and peripheral topics.[27] Basic topics are characterised by their relevance and transversality for bibliometric study in the stomatological field (↑centrality; ↓ density); motor topics distinguished by addressing highly relevant and developed topics (↑centrality; ↑ density); specialised themes deal with less relevant but highly developed topics (↓ centrality; ↑ density); and peripheral or emerging/declining themes are topics that are in a period of obsolescence or, conversely, effervescence (↓ centrality; ↓ density).

RESULTS

The document register consisted of 352 research articles from the three specialised databases, 160 manuscripts were eliminated for duplicates, 2 for language and 6 for grey literature. Thus, the final sample of articles analysed was 184.

Bibliometric characterisation

The bibliometric production has increased at a rate of 4.06% per year with high slopes from the year 2017 with maximum incidence in the year 2022 which implies a growth rate coinciding with the health crisis between 2019-2022.

In table 1, the highest incidence of bibliometric studies was evident at the University of Valencia (n=25) and Hong Kong (n=24), Federal University of Minas Gerais (n=15), University Sains Malaysia (n=15) and Federal University of Rio de Janeiro (n=13). The analysis of this graph shows that in Zone 1 (Figure 2), the most relevant journals in the field of stomatology include:

- Biomed Research International
- Dental Traumatology
- International Endodontic Journal
- Journal of Dental Education
- Journal of Prosthetic Dentistry
- Revista Cubana de Estomatología

Figure 1.

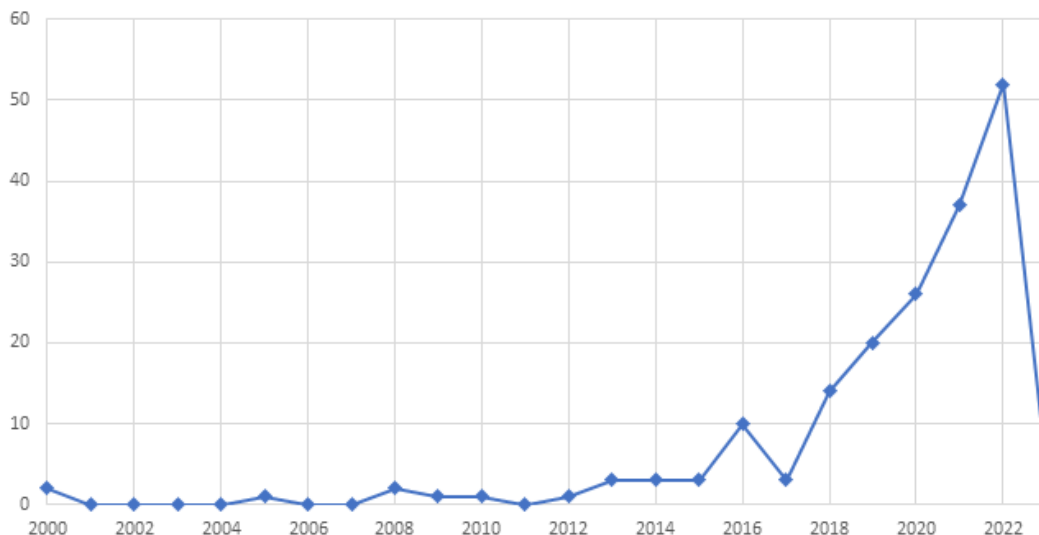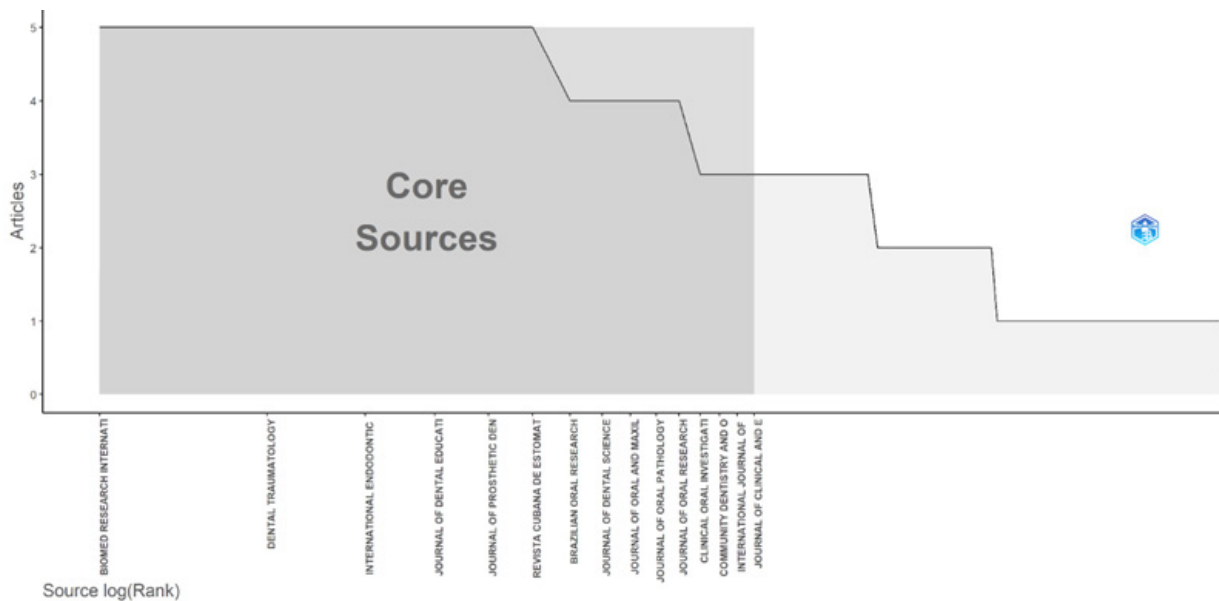Scientific production of bibliometric studies in stomatology.

Figure 2.

Law on the distribution of bibliometric studies in the field of stomatology.

These journals appear to be central to research and bibliometric studies in stomatology, reflecting their higher impact and frequency of citation within the scientific community. Their prominence can be attributed to their consistent publication of high-quality, relevant research that serves as a cornerstone for academic and clinical reference.

The graphic likely visualizes how the concentration of impactful research diminishes as we move to the outer zones, which would include journals with fewer citations or specialized, niche topics. This aligns with Bradford's principle that a small number of core journals will account for the majority of significant contributions in a given field, while many more journals will produce a smaller number of relevant articles.

Expanded Analysis

- Relevance of Journals in Zone 1: Journals like Biomed Research International and International Endodontic Journal reflect a high level of importance due to their broad scope and frequent citation in a variety of stomatology-related studies. These publications likely cover a range of topics that influence both clinical practice and academic research, contributing to their central position in the field.

- Geographical and Language Distribution: The inclusion of the Revista Cubana de Estomatología highlights the importance of regional journals, suggesting that while English-language journals dominate scientific literature, Spanish-language sou-rces maintain significant relevance in certain regions or specific areas of research. This reinforces the global nature of scientific dissemination in stomatology, where rese-arch is being produced and referenced across different cultures and languages.

- Utility of Bradford's Law: Bradford's distribution law is useful for identifying which journals should be prioritized for researchers seeking the most influential articles in their domain. For libraries and

Figure 3.
Scientific production by country on bibliometric studies.

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academic institutions, it can help optimize resources by subscribing to journals in Zone 1, where the most impactful and frequently referenced research is concentrated.

The graphic shows a clear distribution of scientific relevance in the stomatological field, highlighting key journals that are most frequently used in research. The application of Bradford's law allows for a structured understanding of how core and peripheral journals contribute to the advancement of knowledge in this specialized area.

Consequently, the analysis of scientific production by country revealed that there is a high proportion of bibliometric studies in Brazil (n=86), Spain (n=67), China (n=50), India (n=34), Italy (n=29), Saudi Arabia (n=23), Pakistan (n=17), Malaysia (n=15) and Turkey (n=14).
In the international network of institutional affiliation, researchers from Brazil (n=8), Saudi Arabia (n=7), Italy (n=6), Malaysia (n=6)

and India (n=5) were identified as having developed more collaborative research with other countries.

Thematic analysis

In the delimitation of the conceptual categories that are developed in the stomatological field, author keywords were analysed as they have a more precise representation for the structuring of semantic fields. In this sense, there was a greater predominance of research into endodontic procedures (Intersection=138.31) and dental implants within the framework of surgery in children and adolescents, therefore, the most relevant field would be "Administration of endodontic procedures in children and adolescents".

On the other hand, in the second grouping, studies conducive to the analysis of documents by journals or by time ranges were observed, consequently, a methodological delimitation was prioritised against a theme as in group 1. The category was structured on

Figure 4.

Co-occurrence analysis of author keywords from bibliometric studies.

Figure 5.

Strategic diagram of author keywords from bibliometric studies.

the following author keywords representing the cluster domain:
"bibliometric analysis", "dental education", "citation analysis", "collaboration" and "impact factor". The category is named *"Dental education and stomatological bibliometrics".*

The four thematic fields were structured in Table 5. The driving themes were composed of three lines of research: *"Endodontic procedures in children and adolescents", "Dental education and stomatological bibliometrics"* and *"Evidence from the application of orthodontics".*

Table 1.

Inclusion and exclusion criteria for bibliometric articles.

Inclusion criteria	Exclusion criteria
Bibliometric articles	Mixed studies
Published between 2000 and 2023.	Computer and scientometric studies.
Languages: Spanish, English and Portuguese	Grey literature
Availability of access.	Studies based on journal analysis.

Table 2.

Search strategies employed in the databases.

Base de datos	Ecuación de búsqueda
Scopus [n=160]	TITLE (bibliometric) AND (LIMIT-TO (SUBJAREA, "DENT")) bibliometric (Title)
Web of Science [n=107]	Refined by Web Of Science Categories: Dentistry Oral Surgery Medicine
Pubmed [n=85]	((bibliometric[Title])) AND (dentistry[MeSH Terms])

Table 3.

Scientific production of bibliometric studies by institution of affiliation.

N°	Institution of affiliation	Articles
1	UNIVERSITY OF VALENCIA	25
2	THE UNIVERSITY OF HONG KONG	24
3	SCHOOL OF DENTISTRY PAKISTAN	17
4	FEDERAL UNIVERSITY OF MINAS GERAIS (UFMG)	15
5	UNIVERSITI SAINS MALAYSIA	15
6	UNIVERSIDADE FEDERAL DO RIO DE JANEIRO	13
7	UNIVERSIDAD DE CIENCIAS MÉDICAS DE LA HABANA	9
8	UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS	9
9	UNIVERSITY OF CAMPINAS (UNICAMP)	8
10	CENTRAL SOUTH UNIVERSITY	7
11	THAMAR UNIVERSITY	7
12	UFPEL - UNIVERSIDADE FEDERAL DE PELOTAS	7
13	VISHNU DENTAL COLLEGE	7
14	CHINA MEDICAL UNIVERSITY	6
15	FEDERICO II UNIVERSITY OF NAPLES	6

Adjacent to the peripheral thematic field and basic themes are topics oriented to the replication of bibliometric evidence in new temporal and special scenarios. In this sense, a hybrid topic that is located between specialized and peripheral topics is *"Analysis of advances in stomatology"*.

On the level of evidence of peripheral topics, *"Bibliometric indicators applied to stomatology"* is identi-fied as an emerging topic and "Scientific production in the stomatological field" as a declining topic.

DISCUSSION

The findings of this study are developed in two perspectives: analysis of scientific pro-duction indicators and thematic composition of bibliometric studies.

The trend indicated that in the period of 2019 there was a significant increase in bibliometric production. Previous studies[28] have highlighted the relevance of the situ-ation of confinement and physical restric-tion as predisposing events towards the generation of bibliometric evidence, ma-inly because they do not require direct administration of instruments but indivi-dual analysis of manuscripts to categorise evidence, therefore, they are more feasible in situations where mobilisation has been reduced.

The characteristics of the production of the countries in reference to the institution of affiliation, countries and collaborative networks between countries have been mo-dified by the growing proliferation of biblio-metric studies in Brazil.

The relevance of the Latin American country has been highlighted in previous studies[15,29] in conjunction with the Asian nation of China, both of which have presented greater impact and authorial relevance in the period 2000-2023. An attempted explanation for these findings lies in the reforms established in the nation of Brazil at the beginning of the 26th century, reforms oriented to the distribution of health resources, training, implemented capacity, medical education and continuous campaigns of intervention procedures of the different disciplines, among them stoma-tology.[30,31] Consequently, this change in the health system provided an environment for the development of vast bodies of research and, by default, it was necessary to condense information to evaluate its effectiveness for the health system and criteria for effective decision-making.

Likewise, from Bradford's distribution law it was established that most of the main journals located in core 1 were positioned in quartile 1 and 2, which reflects the degree of specialisation of the journals to capture manuscripts that are positioned on the synthesis and analysis of stomatological scientific production to provide evidence to stomatology professionals and provide advances on the discipline for govern-mental decisions and execution of public investment.[13]

Previous studies[32] have partially corrobo-rated the findings in the premise of *"Dental education and stomatological bibliometrics"*, however, in the topic of *"Endodontic proce-dures in children and adolescents"* it was observed that the category of *"Evidence of the application of orthodontics"* had a greater impact on the scientific community. The specific interest of the Peruvian nation in the

category "*Evidence of orthodontic application*" is identified in the problematic implication for its population manifested in the high prevalence rates in the general population sample, the successive technological changes and progress in the delimitation of procedures for professional practice.[33]

CONCLUSION

Two main conclusions are drawn from the findings and contrast:

(a) There was a significant increase in scientific production during the health crisis and countries that carried out health reforms had higher scientific production, and;

(b) Three thematic lines were structured based on "Endodontic procedures in children and adolescents", "Dental education and stomatological bibliometrics" and "Evidence from the application of orthodontics".

The results have practical implications insofar as the relevance of certain countries in the field of stomatology is recognised and therefore professionals could find advances in their line of research and disciplinary goals in Brazil and/or China.

It also reflects the priority findings in the field of stomatology to provide content for the establishment or management of economic-administrative resources in the nations of the world.

The main limitations of the present study lie in the scarce analysis of the public-legislative policies of the nations that could represent a differentiating factor for the production of scientific evidence. Future studies should aim to systematically evaluate the political, social and legal aspects of the countries that enable the development of bibliometric production.

Finally, it is recommended to analyse bibliometric studies as elements of translation towards concrete public health policies, reporting the adaptation time, scope of the system and specialisation of the procedures.

CONFLICT OF INTERESTS

ETHICS APPROVAL

The study adhered to all ethical criteria and information management standards.

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AUTHORS' CONTRIBUTIONS

Walter Tabraj Zacarias: conceptualization; data curation; formal analysis; project administration; resources; software; supervision; validation; visualization; writing – original draft; writing – review and editing.

Eliana Peralta Peña: conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – original draft.

Israel Pariajulca Fernández: conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – review and editing.

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