Dental Caries in People with Disabilities: Bibliometric Study *

Caries en personas en condición de discapacidad: estudio bibliométrico

Cáries em pessoas com deficiência: estudo bibliométrico

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ABSTRACT

Background: Oral diseases, such as caries, pose a global health challenge, particularly for people with disabilities (PwD). **Purpose**: A bibliometric study analyzed trends in this area through advanced searches in PubMed, Dimensions.ai, Embase, Scopus, Web of Science, and Epistemonikos. **Methods**: Studies on caries in PwD were included without restrictions on date or language, selected by two independent reviewers. Microsoft Excel and Vos Viewer 1.6.16 were used for analysis. From 2,878 identified documents, 351 were selected, published between 1953 and the present, with peaks in the 1980s and 2010s. **Results**: English was the predominant language (93.16 %). Multi-disability was the most studied type (166 articles), and four authors stood out in co-authorship. The most frequent keywords were "Dental caries" and "Child," reflecting a shift in research focus over time. **Conclusions**: The findings highlight thematic evolution in research on disability and dental caries, underscoring the importance of exploring additional bibliometric indicators to expand understanding in this field.
Keywords: bibliometrics; dental caries; dentistry; oral health; people with disabilities; scientometrics

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RESUMEN

Antecedentes: Las enfermedades bucales, como la caries, son un reto global de salud, especialmente en personas con discapacidad (PcD). **Objetivo**: Un estudio bibliométrico analizó tendencias en esta área mediante búsquedas avanzadas en PubMed, Dimensions.ai, Embase, Scopus, Web of Science y Epistemonikos. **Métodos**: Se incluyeron investigaciones sobre caries en PcD sin restricción de fecha o idioma, seleccionadas por dos revisores independientes. Para el análisis se usaron Microsoft Excel y Vos Viewer 1.6.16. De los 2878 documentos identificados, se seleccionaron 351, publicados entre 1953 y la actualidad, con picos en las décadas de 1980 y 2010. **Resultados**: El inglés predominó como idioma (93,16 %). La multidiscapacidad fue el tipo más estudiado (166 artículos), y cuatro autores destacaron en coautoría. Las palabras clave más frecuentes fueron "Dental caries" y "Child", reflejando un cambio en los enfoques de investigación con el tiempo. **Conclusiones**: Los resultados evidencian una evolución temática en la investigación sobre discapacidad y caries dental, subrayando la importancia de explorar otros indicadores bibliométricos para ampliar la comprensión de esta área.
Palabras claves: bibliometría; caries dental; cienciometría; odontología; personas con discapacidad; salud bucal

RESUMO

Antecedentes: As doenças bucais, como a cárie, são um desafio de saúde global, especialmente em pessoas com deficiência (PcD). **Objetivo**: Um estudo bibliométrico analisou tendências nesta área por meio de buscas avançadas no PubMed, Dimensions.ai, Embase, Scopus, Web of Science e Epistemonikos. **Métodos**: Foram incluídas pesquisas sobre cárie em PcD

sem restrições de data ou idioma, selecionadas por dois revisores independentes. Microsoft Excel e Vos Viewer 1.6.16 foram utilizados para a análise. Dos 2.878 documentos identificados, foram selecionados 351, publicados entre 1953 e a atualidade, com picos nas décadas de 1980 e 2010. **Resultados**: O inglês predominou como idioma (93,16 %). A multe eficiência foi o tipo mais estudado (166 artigos), e quatro autores se destacaram como coautores. As palavras-chave mais frequentes foram "Cárie dentária" e "Criança", refletindo uma mudança nos focos de pesquisa ao longo do tempo. **Conclusões**: Os resultados mostram uma evolução temática nas pesquisas sobre deficiência e cárie dentária, ressaltando a importância de explorar outros indicadores bibliométricos para ampliar a compreensão desta área.
Palavras-chave: bibliometria; cárie dentária; cienciometria; odontologia; pessoas com deficiência; saúde bucal

INTRODUCTION

Oral diseases represent a significant global health challenge, affecting approximately 3.5 billion people, particularly in middle-income countries. The major disease burdens include untreated caries in primary and permanent teeth, severe periodontal disease, edentulism (total tooth loss), and lip and oral cavity cancer. Permanent tooth caries top the list with around 2 billion cases, followed by periodontal disease with nearly 1 billion, caries in primary teeth with approximately 510 million, and edentulism with 350 million, all recorded in 2019 (1). Furthermore, the distribution of these diseases is not uniform, following social patterns that disproportionately affect the most vulnerable and disadvantaged groups throughout life, including individuals with disabilities (PwD) (1).

Although the prevalence of caries is not necessarily higher in PwD than in the general population, this group often has more untreated caries lesions. Additionally, they exhibit poorer oral hygiene and more unfavorable periodontal conditions compared to individuals without disabilities (2). Specifically among individuals with intellectual disabilities, dental caries and periodontal disease are highly prevalent oral health issues. The epidemiology of caries in this population is comparable to or even lower than that of the general population. However, untreated caries are consistently more common in individuals with intellectual disabilities compared to the general population (3).

There is a substantial body of scientific literature addressing the issue of caries in the PwD (4-10). Numerous studies have investigated the prevalence, risk factors, and treatment particularities of caries in this specific group, providing a solid foundation to understand and address the challenges faced by this population in terms of oral health (11-14). In the systematic review by Ward, *et al.* (2019) (10), most studies reported insufficient oral hygiene and gum health. Specifically, a considerable prevalence of periodontal diseases was found, with periodontitis rates ranging from 22.5 % to 69.2 % in adults with intellectual disabilities. Additionally, a high incidence of untreated dental caries was reported, suggesting a significant level of unmet oral health needs. The studies included data from various countries, including Italy, Belgium, the U.S., South America, and the U.K., indicating a consistent pattern of poor oral health among adults with intellectual disabilities across different regions. In the study by Hughes and Gazmararian (2015) (15), participants from low-income countries experienced fewer adverse health outcomes than expected. While those from low- and middle-income countries reported more oral pain and untreated caries, they exhibited fewer issues such as missing teeth, lesions, and gingivitis compared to participants from high-income countries.

A bibliometric study, on the other hand, collects data from scientific articles to obtain fundamental metrics. Bibliometric indicators, numerical data derived from bibliographic characteristics, allow for the analysis of scientific activity in terms of information production and usage. This type of research applies statistical methods to examine various aspects of bibliometric data, such as publication content, references, citations, and co-authorships. These descriptive studies facilitate the mapping of scientific knowledge, summarize data to identify the current state of production, highlight emerging trends, and advance the understanding of a specific topic or field of knowledge (16).

Given the significant scientific attention dedicated to dental caries in PwD, conducting a comprehensive analysis of the main bibliometric indicators related to this topic is highly relevant. This

type of analysis provides a panoramic view of the current state of knowledge and highlights areas where research could benefit from increased focus. In the specific context of this investigation, a bibliometric analysis would help identify research gaps, highlight successful approaches, and offer strategic guidance for future projects. Consequently, the research question was: What bibliometric indicators can be used to map and characterize the scientific production on dental caries in the PwD, considering the type of disability, publication language, co-authorship, and co-occurrence? In this context, the purpose of this study was to analyze certain bibliometric indicators of scientific production related to dental caries in the PwD.

MATERIALS AND METHODS

Research Type and Study Design

A scoping systematic review of the literature was conducted, with a scientometric bibliometric design, focusing on the scientific production related to dental caries in PwD.

Inclusion Criteria

Scientific articles were included without publication date limits, focusing on populations with various disabilities and dental caries, published in any language. No exclusion criteria were defined.

Data Sources and Search Strategy

Comprehensive and systematic searches were conducted across various databases, adapting queries to the user interface of each platform. Controlled terms in English (MeSH) were used, along with synonyms and related concepts. Boolean operators OR and AND were employed to expand and narrow the searches, respectively. Table 1 presents the search algorithms used for each database.

TABLE 1
Search Strategy for Each Database

Database	Search Strategy
PubMed	disabled persons AND dental caries
Scopus	(TITLE-ABS-KEY (disabled AND persons) AND TITLE-ABS-KEY (dental AND caries))
Embase	('disabled person'/exp OR 'disabled person') AND 'dental caries':ti,ab,kw AND [2000-2023]/py
Dimensions	disabled persons AND dental caries
Web of Science	disabled persons AND dental caries
Epistemonikos	(title:((title:(disabled persons) OR abstract:(disabled persons)) AND (title:(dental caries) OR abstract:(dental caries))) OR abstract:((title:(disabled persons) OR abstract:(disabled persons)) AND (title:(dental caries) OR abstract:(dental caries))))

Source: the authors

Deduplication and Study Selection Process

Duplicate articles were removed using the desktop version of Mendeley. Two reviewers (JABU and JCTR) independently conducted the article selection process, ensuring compliance with the established criteria. The first selection stage was based on reviewing titles and abstracts, followed by a full-text

analysis. Any discrepancies in selection were resolved between the reviewers at the end of the selection process, at which point blinding was removed. The Rayyan.ai tool was used.

Data Analysis and Bibliometric Indicators

Several bibliometric indicators of the selected articles were analyzed: year and language of publication, type of disability studied, co-authorship, and co-occurrence. Tables and graphical representations were constructed using Microsoft Excel, while the visualization of mapped information was performed with Vos Viewer version 1.6.16.

Year of Publication

The publication year of each selected article was recorded. The number of documents published each year was calculated and visually presented through graphical representations.

Language of Publication

The publication language of each selected article was identified. Subsequently, the number of documents published in each language was calculated, and this information was visually presented using graphs.

Types of Disability

The types of disabilities studied in each article were identified: sensory, intellectual, physical, and multi-disability (the presence of two or more simultaneous disabilities, such as a person with both intellectual and sensory disabilities). The article counts by type of disability were graphically presented.

Co-authorship

Co-authorship refers to the collaboration between authors in producing a scientific article. The full counting method was used, meaning each co-occurrence link was assigned equal weight. Maps were constructed based on bibliographic data, where relationships were determined according to the number of co-authored articles.

Co-occurrence

The co-occurrence of words refers to the frequency with which two or more specific words appear together or in close proximity within a text. A full counting method was applied, meaning each co-occurrence link was assigned equal weight. The minimum threshold was set at 10 co-occurrences. Keywords were considered the unit of analysis, and fractional counting was used. Network visualizations were created by thematic area and by overlapping by year.

RESULTS

Identified and Selected Studies

The search conducted on February 9, 2023, yielded 2,878 documents distributed as follows: 2,285 were identified through Dimensions, 260 via PubMed, 217 in Scopus, 85 in Embase, 27 in Web of Science, and 4 in Epistemonikos. A total of 105 duplicate studies were identified during the process. After thorough screening, 2,350 documents were evaluated, of which 1,999 were excluded, and 351 were deemed relevant for the research, as shown in Figure 1.

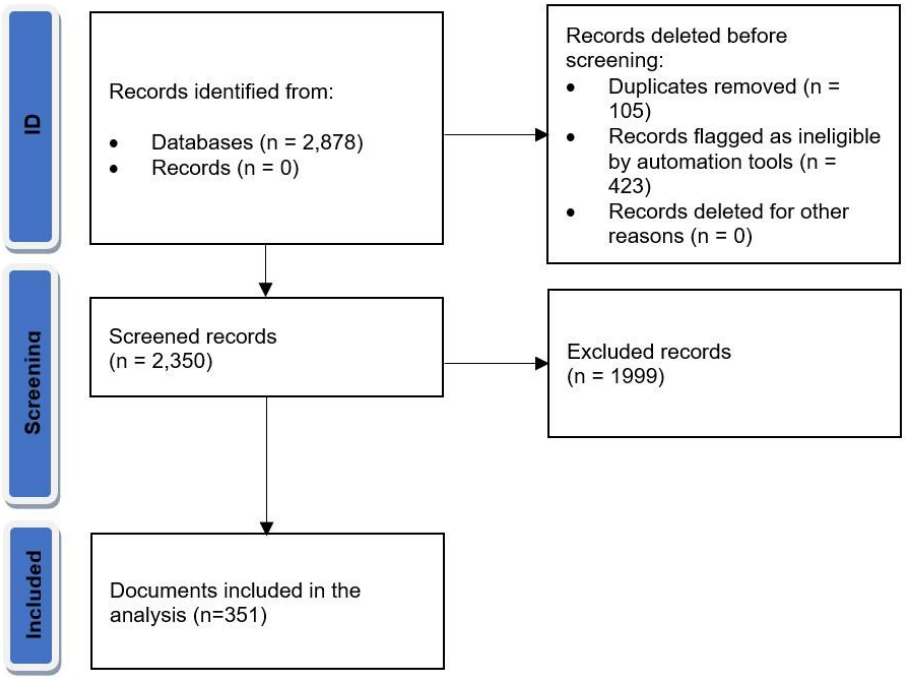

FIGURE 1
Flowchart of the Process of Searching and Selecting Articles

Year of Publication

As shown in Figure 2, the first document was published in 1953. From 1953 to 1959, a consistent output of one article was maintained, representing 0.28 % of the total bibliographic production. In the following decade (1965-1972), the contribution doubled to two articles, accounting for 0.56 % of the total. The period from 1973 to 1978 saw a significant increase with the publication of eight articles, contributing 2.27 % to the overall total.

The decade from 1980 to 1985 showed a marked increase, with 15 articles published, representing 4.27 % of the total bibliographic output. In the following period, from 1986 to 1991, a steady pace was maintained, resulting in 25 articles. Between 1992 and 1997, 16 articles were published (4.55 % of the total), while the next period (1998-2004) recorded 23 articles (6.55 %).

The period from 2005 to 2010 experienced a significant increase, with 45 articles published. The following decade (2011-2017) marked a peak with 109 articles, representing a prominent phase in

research in this field. From 2018 to the date of the search, 107 articles have been published, maintaining notable research activity.

These findings highlight the temporal evolution of article production, revealing phases of growth, stability, and notable peaks over time.

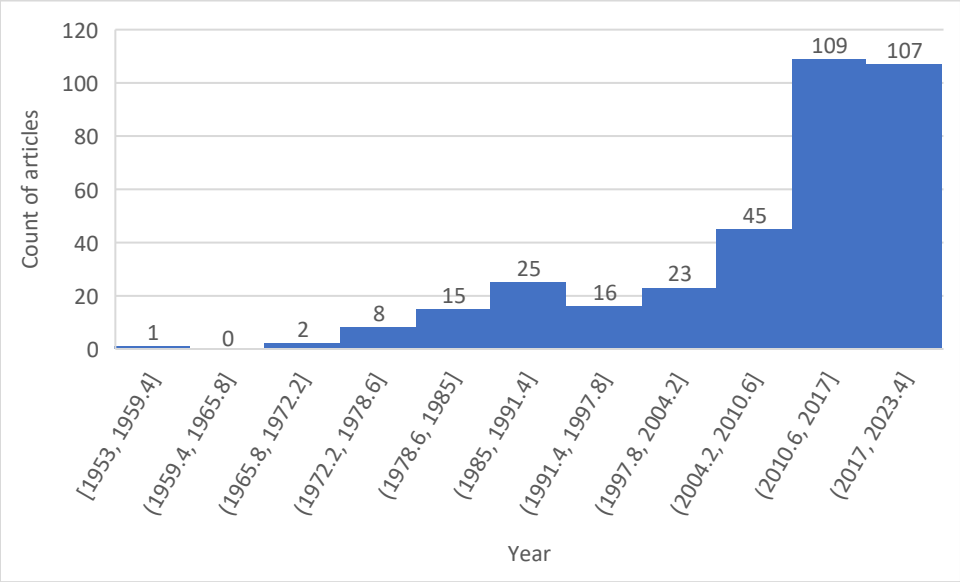

FIGURE 2
Year of Publication of the Scientific Production

Language of Publication

A total of 327 articles were published in English, representing 93.16 % of the total. This was followed by German with 9 articles (2.56 %) and Japanese with 4 articles (1.13 %). Two articles were recorded for each of the following languages: Polish, Russian, Spanish, and French. Additionally, one article was published in Chinese (0.28 %) and another in Turkish.

This analysis reveals a pronounced disparity in publication language. English dominated with 93 %, emerging as the primary language for article publication. This predominance underscores the significant influence of English in scientific communication, serving as the majority language in more than half of the articles. The contrast with other languages was striking, highlighting the global relevance of English in academic and scientific fields.

Publications on Types of Disability

The type of disability with the highest number of articles is multi-disability, referring to individuals with two or more simultaneous conditions, whether physical, mental, sensory, emotional, intellectual, cognitive, or social. Multi-disability accounts for the majority of published articles, totaling 166 (47.29 %). Next, in order of prevalence, is intellectual disability with 102 articles (29.05 %), followed by physical disability with 81 articles (23.07 %). Finally, sensory disability shows the lowest incidence, with only 2 articles published (0.56 %) (Figure 3).

In this context, it can be observed that multi-disability and intellectual disability are the most frequently cited in the selected articles. These two types of disability show an 18.24% difference in incidence.

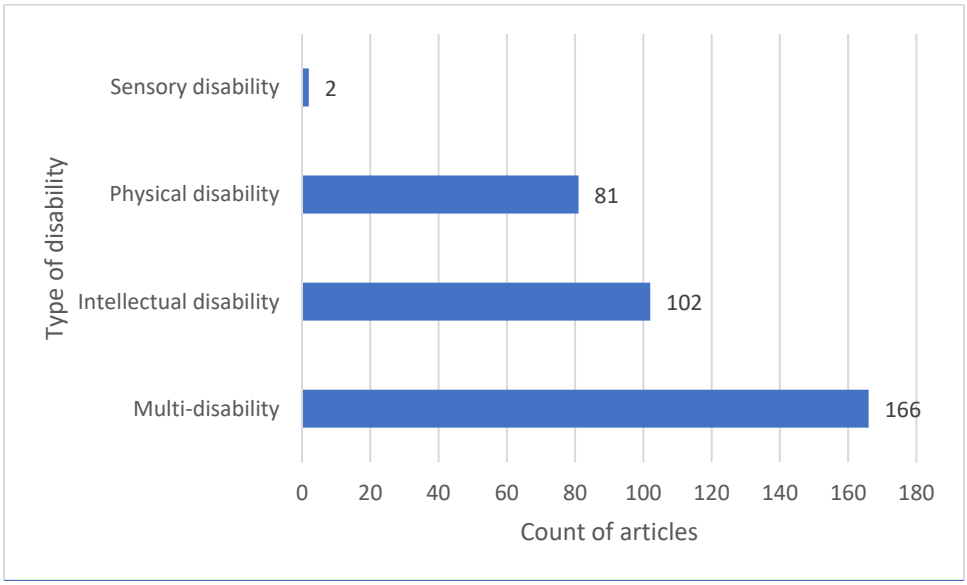

FIGURE 3
Publication According to Research on Type of Disability

Co-authorship

Four main authors stood out for their high publication index: Gabre, P.; Wayne, A.; Shapira, J.; and Mann, J. Their publication index is similar and proportional, with each contributing at least four articles.

Co-occurrence

Regarding co-occurrence, as shown in Panel A of Figure 4, regardless of the publication year, the most frequent words were "Dental caries" and "Child," while less frequent terms included "Humans" and "Female." On the other hand, the least frequent words were "Only child," "Health status," "Prevalence," "Disabled persons," and "Dental care for disabled adult."

Four clusters were identified: the first encompassed the words "dental caries," "disabled persons," "child," "only child," and "child-preschool." The second cluster primarily included the words "humans," "health status," "prevalence," and "cross-sectional studies." The third group addressed the words "female," "human," and "mouth hygiene." Finally, a fourth cluster included the words "adult," "dental care for disabled," "aged," and "periodontal disease" (Figure 4, Panel B).

Over the years, there have likely been shifts in research focus, reflected in the highlighted keywords in the studies. In the early 2000s, prominent keywords included "disabled persons," "dmf index," "dental care for disabled," and "periodontal disease." Between 2005 and 2010, terms such as "dental caries," "female," "child," "prevalence," "human," and "mouth hygiene" emerged as key highlights. By around 2015, research interests expanded to include "health status," "cross-sectional studies," "quality of life," "intellectual impairment," and "young adult." These changes in keywords over different periods suggest an evolution in research approaches within the field, possibly reflecting shifts in priorities and topics of interest in the scientific literature (Figure 4, Panel C).

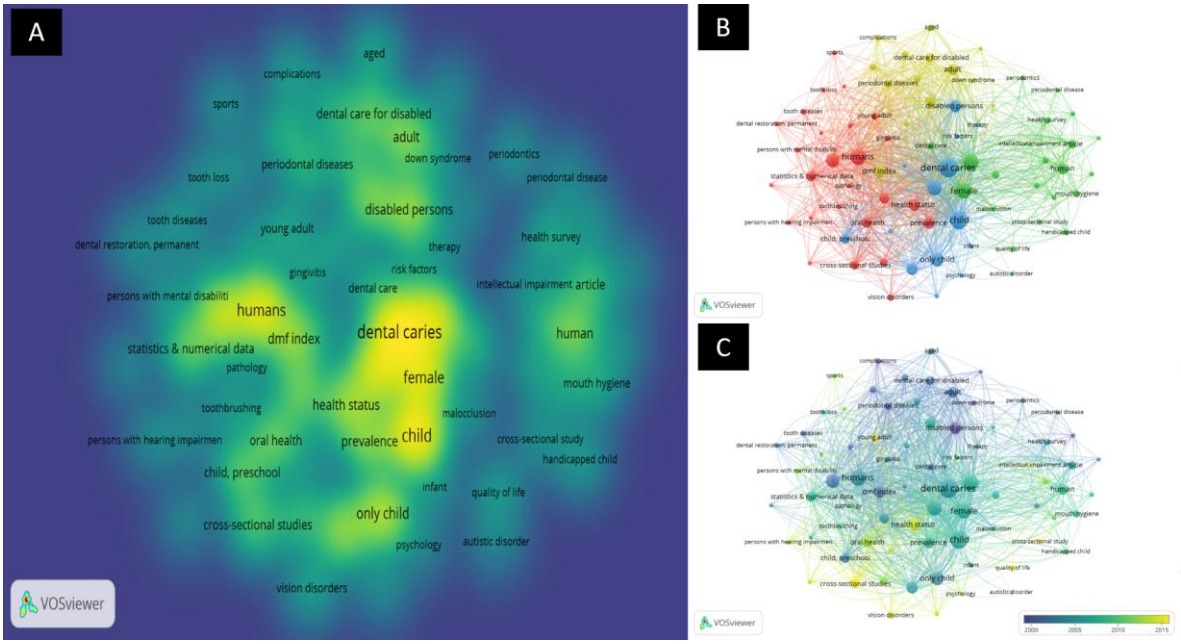

FIGURE 4
Keyword Co-occurrence Analysis

DISCUSSION

This bibliometric study provides a descriptive overview of scientific production on dental caries in PwD, mapping the evolution of research and predominant themes over time. Our findings reveal a temporal evolution in article production, with notable peaks in the 1980s and 2010s. English dominated as the language of publication (93.16 %), highlighting its global influence. Multi-disability was the most studied type (47.29 %), followed by intellectual disability (29.05 %). Co-authorship analysis revealed the key contributions of four main authors, emphasizing the importance of scientific collaboration. The co-occurrence of key terms indicated recurring themes, with possible shifts in emphasis over time. These results offer insight into the research landscape on disability, highlighting trends, notable collaborations, and thematic changes over the years.

The value of this analysis lies in its ability to identify research gaps, such as the lack of studies in other languages and the geographic concentration of production in certain countries. These findings can guide future research and public health strategies, promoting greater inclusion of studies in languages other than English and in underrepresented geographic regions.

Compared to other approaches, such as systematic reviews, bibliometric analysis provides a quantitative perspective on the evolution and trends in research but does not offer a detailed assessment of the methodological quality of individual studies. While this quantitative approach facilitates the identification of gaps and opportunities, it lacks the critical depth characteristic of systematic reviews, which focus on evaluating the available evidence and the effectiveness of clinical interventions.

Both approaches are complementary: while systematic reviews focus on synthesizing and evaluating the outcomes of clinical studies, such as preventive and therapeutic strategies for dental caries in PwD, bibliometric analysis facilitates mapping scientific development over time, identifying publication patterns, collaboration, and emerging keywords. For instance, a recent systematic review updated strategies for managing caries in PwD. This study emphasized that, although the prevalence of caries is not necessarily higher in this population compared to the general population, there is a significant burden of untreated lesions, as well as poorer oral hygiene and a more deteriorated periodontal condition (2).

This reinforces one of the key points of our study, where we identified that research focuses on untreated oral problems, aligning with the clinical findings of systematic reviews.

Furthermore, that systematic review highlights the importance of personalized interventions, such as dental hygiene programs implemented by hygienists or parental training for children with autism spectrum disorder, which have shown promising results in improving brushing habits and reducing plaque index (2). These therapeutic approaches contrast with bibliometric findings, which emphasize the prevalence of multi-disability and a focus on descriptive studies rather than direct clinical interventions. The lack of comparative strategies in bibliometric research may indicate a gap in the literature that future studies could address, integrating both clinical studies and bibliographic metrics.

On the other hand, the systematic review also highlighted disparities in the quality and availability of treatments for PwD, an aspect our study similarly suggests by emphasizing the predominance of English and the geographic concentration of studies in high-income regions (2). This is a relevant point for understanding the limitations of research in underrepresented regions and the language barrier in scientific production, issues that could be addressed in future studies.

This study presents several limitations. Although articles in various languages were included, most of the literature is in English, which may have biased the coverage of the topic. Additionally, the concentration of studies in developed regions limits the generalizability to low- or middle-income countries, possibly due to the research infrastructure available in these contexts. Moreover, the study did not analyze all bibliometric indicators, restricting a more comprehensive understanding of the landscape. Further research is recommended to delve deeper into these aspects.

CONCLUSIONS

The primary objective of this study was to analyze some bibliometric indicators of scientific production related to dental caries in PwD.

The research revealed significant growth in scientific production on disability. Since the first article was published in 1953, there has been a notable increase in publications, particularly between 2011 and 2017, reflecting a growing interest in this field.

English dominated as the publication language (93.16 %), highlighting the need to diversify the languages used to disseminate findings to improve access to research.

Multi-disability was the most studied type of disability, followed by intellectual and physical disabilities, suggesting insufficient attention to sensory disabilities. The identification of key authors and trends in keywords indicates a collaborative approach and the evolution of research topics over time.

These findings underscore the importance of continuing to promote research addressing various dimensions of disability, as well as the need to enhance collaboration among researchers and communities.

RECOMMENDATIONS

It is recommended to diversify publications into languages beyond English to broaden access and perspectives, as well as to expand geographic coverage to low- and middle-income countries to better understand their needs. A more comprehensive analysis of bibliometric indicators and the promotion of interdisciplinary research are also essential. Additionally, establishing a continuous monitoring system for trends in scientific production is suggested to identify emerging areas and adapt funding strategies. These actions will enrich knowledge about disability and enhance policies and practices that benefit this population.

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*Original research.

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