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Review

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Applications of cryotherapy in dentistry: mapping 61 years of research through a bibliometric review

Aplicações da crioterapia em odontologia: mapeando 61 anos de pesquisa por meio de uma revisão bibliométrica

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ABSTRACT

Objectives: Cryotherapy is a therapeutic alternative with relevant applications in dentistry. This study aimed to conduct a bibliometric analysis on its use in dental procedures. **Material and Methods:** A search was conducted in the Web of Science Core Collection database in May 2025. Three independent reviewers selected the articles about the use of Cryotherapy in Dentistry. The following data were collected: number and density of citations, year of publication, journal, impact factor, study design, main themes, country, continent, institution, authors, and keywords. Collaborative networks were generated using VOSviewer. Spearman's test was used to determine the correlation between the number of citations, year of publication, and impact factor. **Results:** A total of 2,437 articles were identified, with 163 included. The most cited study had 207 citations. Publications ranged from 1964 to 2025, peaking in 2021 (n=13). The Journal of Oral and Maxillofacial Surgery was the most frequent journal (n=14). Clinical trials were the most common study design (n=58). Cryotherapy was mainly used for analgesia (n=42), especially in oral medicine (n=63). Clark GT authored the most studies (n=7), and the University of California led institutional output (n=9). The United States was the most represented country (n=28), while Asia was the leading continent (n=57). **Conclusion:** Research on cryotherapy in dentistry has grown in recent years, mainly in Asia. Its use is most frequent in analgesia-related procedures, especially in stomatology, through clinical trials.

KEYWORDS

Bibliometric analysis; Cold therapy; Cryotherapy; Dentistry; Pain management.

RESUMO

Objetivos: A crioterapia é uma alternativa terapêutica com aplicações relevantes na odontologia. O objetivo foi realizar uma análise bibliométrica sobre o uso da crioterapia em procedimentos odontológicos. **Material e Métodos:** Uma busca foi realizada na *Web of Science Core Collection* em maio de 2025. Três revisores independentes selecionaram os artigos sobre o uso da crioterapia na Odontologia. Foram coletados: número e densidade de citações, ano de publicação, periódico, fator de impacto, delineamento do estudo, principais temas, país, continente, instituição, autores e palavras-chave. Redes de colaboração foram geradas utilizando o software *VOSviewer*. O teste de Spearman foi utilizado para determinar a correlação entre o número de citações, o ano de publicação e o fator de impacto. **Resultados:** Um total de 2.437 artigos foi identificado e 163 foram incluídos. O estudo mais citado apresentou 207 citações. As publicações variaram de 1964 a 2025, com pico em 2021 (n=13). O *Journal of Oral and Maxillofacial Surgery* foi o periódico mais frequente (n=14). Ensaio clínico foi o delineamento de estudo mais comum (n=58). A crioterapia foi utilizada principalmente para analgesia (n=42), especialmente na estomatologia/patologia oral (n=63). Clark GT foi o autor com maior número de estudos

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(n=7), e a Universidade da Califórnia liderou a produção (n=9). Estados Unidos foi o país mais representado (n=28), enquanto a Ásia foi o continente líder (n=57). **Conclusão:** A pesquisa sobre crioterapia na odontologia tem crescido nos últimos anos, principalmente na Ásia. Seu uso é mais frequente em procedimentos relacionados à analgesia, especialmente na estomatologia, por meio de ensaios clínicos.

PALAVRAS-CHAVE

Análise bibliométrica; Terapia gelada; Crioterapia; Odontologia; Manejo da dor.

INTRODUCTION

Cryotherapy is a therapeutic technique that uses extremely low temperatures to control symptoms and assist in the treatment of health conditions [1]. The earliest records of the use of cryotherapy date back to 2500 BC, with the Egyptians who used cold to treat wounds and inflammation [2]. Currently, the application of cold is widely recognized in medicine, especially for the management of postoperative pain, as its physiological effects include the reduction of the local inflammatory response, nerve impulse conduction velocity, hemorrhage and postoperative edema [3,4].

In dentistry, cryotherapy has gained prominence and become an area of growing interest, being widely applied in the control of pain and edema [1-5]. Many dental procedures are invasive and can cause discomfort to the patient, which has led to the introduction and recognition of cryotherapy in several dental specialties [6-8]. Among these, cryotherapy is used in oral surgery both intraoperatively, as a complementary anesthetic approach, and postoperatively to control pain and edema [7], in endodontics as complementary analgesia [6], and in pediatric dentistry as an anesthetic aid or distraction technique during invasive procedures [8].

The demand for non-pharmacological techniques for pain control and for performing some surgical procedures has been on the rise, either due to preference or some patient specificity and, in this sense, the clinical relevance of cryotherapy has led to an increase in the number of studies on this topic in recent years [9,10]. However, despite the ease and low cost of the technique, it is essential that cryotherapy be performed with caution and adequate guidance, due to the risk of complications such as frostbite [11]. Therefore, primary scientific studies are needed to standardize and support clinical protocols, followed by secondary studies to evaluate their actual benefits. In addition, it is recommended to prepare secondary studies, such as reviews, to carry out a comprehensive analysis of the large volume of document published, in order to guide future research.

Bibliometric reviews are scientific tools that allow you to conduct a comprehensive and detailed analysis of a research area [12]. These analyses have the potential to identify key areas of interest and gaps in the literature that require further investigation, as well as assess research impact and trends [13,14]. In dentistry, the publication of bibliometric reviews has become increasingly common due to their valuable contributions and discoveries [15-18]. However, to date, no bibliometric analysis has been identified on the use of cryotherapy in dentistry. Therefore, the aim of this study is to compile and analyze all existing publications on cryotherapy in dentistry, providing a broad and relevant view to the scientific community through a bibliometric analysis.

MATERIAL AND METHODS

This literature review was conducted in accordance with the preliminary guideline for reporting bibliometric reviews of biomedical literature (BIBLIO) [19] and registered with the OSF under DOI number 10.17605/OSF.IO/ZXWJQ. The following search strategy was formulated based on Medical Subject Headings (MeSH) terms, keywords, and synonyms, and applied to the Web of Science – Core Collection (WoS-CC) database in May 2025: [TS= (Cryotherapy OR “cold therapy” OR cold* OR Cryotherapies OR “Cold Therapies” OR “Therapies, Cold” OR “Therapy, Cold” OR ice*) AND WC=(“Dentistry, Oral Surgery, and Oral Medicine”)]. Article selection was performed by screening titles, abstracts, and full-text assessment when necessary. Three independent researchers (MCG, AOR, and IR), after theoretical training and discussion of the inclusion criteria conducted the selection process. A fourth reviewer (MC) was consulted to resolve disagreements. All studies addressing the use of cryotherapy in dentistry,

published up to the search date and with no language restrictions, were considered eligible. The following exclusion criteria were applied: (1) studies using low temperature for pulp sensitivity testing, (2) studies using low temperature to cool dental materials to improve their properties, and (3) commentaries, editorials, and conference papers.

From each included article, the following data were extracted: number and density of citations, year and journal of publication, impact factor (IF, 2023, Journal Citation Reports), document type, study design, thematic focus, country, continent, institution (based on the corresponding author), authors, and keywords. Study designs were categorized as: (1) systematic reviews; (2) literature reviews; (3) observational studies; (4) randomized clinical trials; (5) laboratory studies; and (6) case reports.

Two thematic domains were defined: primary objective and dental field. For the "primary objective" domain, studies were classified as follows: analgesia, excision/enucleation, postoperative care, anesthesia, pathology prevention, anti-inflammatory effect, cryosurgery, hemostasis, oncological treatment, antimicrobial resistance, or other. Regarding the "dental field" domain, studies were grouped into oral medicine, surgery, endodontics, orofacial pain, pediatric dentistry, periodontics, general dentistry, implantology, or other. This classification was based on the information reported in the title, abstract or full text, when available. If the article was not explicitly reported or could not be accessed, the topic was classified as "not identified".

Data from the included articles were exported to Microsoft Excel® 2010 (Microsoft, Redmond, WA, USA). VOSviewer software (version 1.6.18) was used to generate graphical representations of author and keyword co-occurrence. In network analysis, larger nodes represent more frequent keywords, while keywords sharing the same color and interconnected form clusters, indicating stronger collaboration among studies.

Statistical analyses were performed using SPSS for Windows (SPSS, version 24.0; IBM, Armonk, USA). Data distribution was first assessed using the *Kolmogorov-Smirnov* test. Since the assumption of normality was not met ($p<0.05$), Spearman's correlation test was applied to evaluate associations between citation counts, year of publication, and journal impact factor.

RESULTS

The initial search identified a total of 2,437 records. After this process, 163 articles were included for bibliometric analysis, as shown in Figure 1. Among the excluded records, four

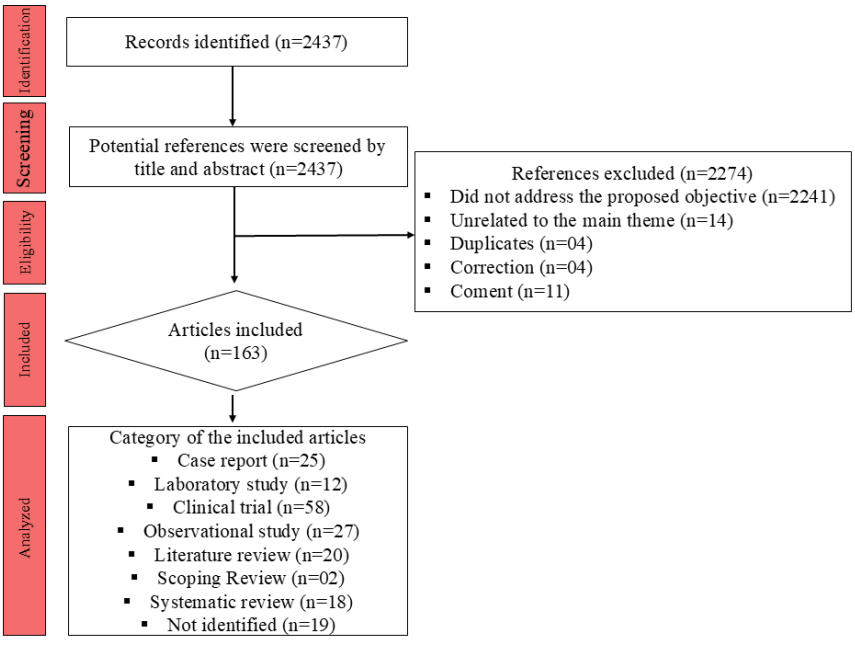


Figure 1 - Flowchart of the study selection process.

were duplicates, four were corrections, eleven were comments and fourteen were unrelated to the main topic, and the others (n=2241) were excluded because they did not address the objective of the study.

The selected papers have accumulated a total of 2,243 citations in the WoS-CC database. The average number of citations per year was 38.40. The most cited article in WoS-CC was "Oral mucositis", with 207 citations, published in Oral diseases [20]. Spearman's correlation revealed a weak negative correlation between year of publication and the journal's impact factor (ρ = -.156; $p<0.05$), and a moderate negative correlation between the number of citations and the year of publication (ρ = -.463, $p<0.001$), indicating that older studies tend to be more cited.

The publications occurred between 1964 and 2025, covering a total of 61 years since the first identified study. The oldest document is dated 1964, likewise the most recent, until May 2025, totalling five [6,7,10,21,22]. The most prominent years in terms of number of publications were 2021, 2022, and 2023, with 13, 12, and 12 articles, respectively. Over the last five years, from 2021 to 2025, 29.05% of the articles included in this review (n=52), indicate a recent and growing interest in this topic. Table I illustrates the main publication trends over 20-year intervals regarding the use of cryotherapy. Notably, over the past 20 years, there has been an increase in both the number of publications and citations, and that the specialty area of stomatology has remained the leading field on this topic over the last 61 years. The complete list of included articles is provided in Supplementary Material Table I.

The journal with the highest number of publications was the Journal of Oral and Maxillofacial Surgery (n=14), followed by the Journal of Dental Research (n=11) and the British Journal of Oral & Maxillofacial Surgery (n=11). Table II presents the journals with the

Table I - Main global trends on the use of Cryotherapy in Dentistry over the years

Main trends	1964-1983 (n=20)	1984-2003 (n=34)	2004-2025 (n=109)
Citations	242	628	1473
Authors	Aldrouby, HAL (n=3)	Maekawa, K (n=2)	Larsen, MK (n=2)
Country	USA (n=7)	USA (n=10)	China (n=16)
Journal	Journal of Dental Research (n=5) Journal of Oral Surgery (n=5)	Archives of Oral Biology (n=6) Journal of Oral and Maxillofacial Surgery (n=6)	Journal of Oral and Maxillofacial Surgery (n=8)
Study design	Not identified (n=9) Case report (=8)	Clinical trial (n=9)	Clinical trials (n=47)
Main objective	Not identified (n=12) Excision/ enucleation (n=5)	Analgesia (n=11)	Analgesia (n=28)
Area of dental specialty	Stomatology (n=10)	Stomatology (n=13)	Stomatology (n=33)

Table II - Journals with the most number of publications on cryotherapy in dentistry

Source Title	Number of articles	Impact factor 2023
Journal of Oral and Maxillofacial Surgery	10	2.3
British Journal of Oral & Maxillofacial Surgery	10	1.7
Journal of Endodontics	7	3.5
Archives of Oral Biology	7	2.2
Internation Journal of Oral and Maxillofacial Surgery	6	2.2
Journal of The American Dental Association	5	3.1
Journal of Oral Surgery*	5	0.0
Clinical Oral Investigation	4	3.1
Journal of Oral Rehabilitation	4	3.1
Journal of Cranio-Maxillofacial Surgery	3	2.1
Journal of Dental Research	3	5.7

*Journal of Oral Surgery was the former title of the Journal of Oral and Maxillofacial Surgery until 1981. Due to this title change, its current Journal Impact Factor (JCR 2023) is listed as 0.0 in the database index.

highest number of publications on the topic and their respective impact factors. Journal of Clinical Periodontology (IF 5.8; n=01), Journal of Dental Research (IF 5.7; n=11) and International Endodontic Journal (IF 5.4; n=01) were the journals with publications on the subject, with the highest Impact Factors in 2023 according to Journal Citation Reports (JCR).

The most frequently used study design was clinical trials (n=58), followed by observational studies (n=27), case reports (n=25), literature reviews (n=22), systematic reviews (n=18) and laboratory studies (n=12). Regarding the objective of the studies, the following themes were identified: analgesia (n=42), excision/enucleation (n=34), postoperative (n=21), anesthesia (n=15), prevention of pathologies (n=14), cryosurgery (n=06), anti-inflammatory (n=05), hemostasis (n=02), oncological treatment (n=02) and antimicrobial resistance (n=01). In twenty-one documents, the objectives could not be identified. Regarding the area of dental specialty, oral medicine (n=63) stood out, followed by surgery (n=29), endodontics (n=24), orofacial pain (n=22), pediatric dentistry (n=13), periodontics (n=04), general practice (n=03) and implantology (n=01). The area cannot be identified in three documents.

Publications on cryotherapy originated from 36 countries, with the highest number of publications coming from the United States (n=28), the United Kingdom (n=18), and India (n=17). At the continental level, accounted for the highest number of publications Asia (n = 57), followed by Europe (n=44) and North America (n=31). The worldwide distribution of publications is illustrated in Figure 2, where lighter shades represent countries with fewer publications and darker shades indicate those with higher publication output.

A total of 119 distinct institutions were identified among the corresponding authors of the selected studies. The University of California (USA) was the institution with the highest number of documents (n=09). Table III presents the top 10 institutions in terms of number of documents.

In total, 554 unique authors contributed to the included publications. The authors with the highest number of articles on cryotherapy in dentistry were Clark GT (n=7), Kuboki T (n=7), Maekawa K (N=6) and Nally F (n=6). Figure 3 highlights the collaboration and the main groups of authors, including authors with at least three publications, while Table IV lists the 10 most productive authors.

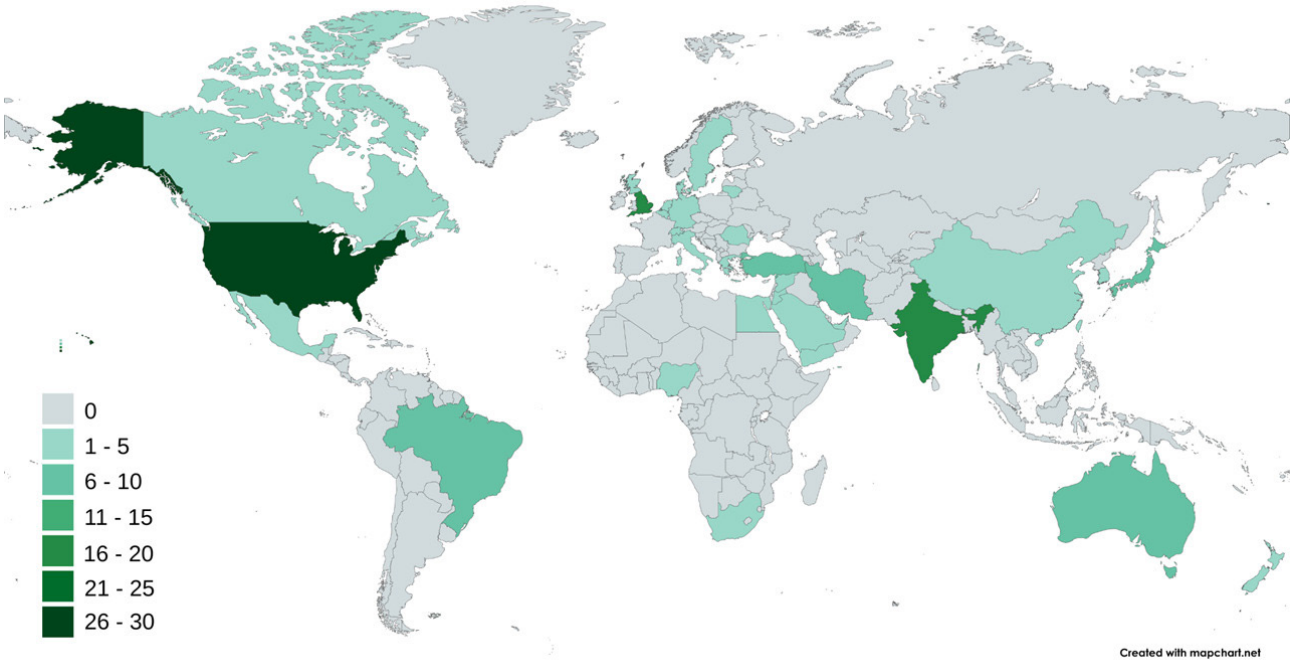


Figure 2 - Global distribution of cryotherapy use in dentistry.

Table III - Top 10 institutions associated with Cryotherapy research

Institution	Country	Number of articles	Number of citations
University of California	USA	9	229
University of London	England	5	224
Okayama University Dental School	Japan	5	61
Eastman Dental Hospital	England	4	89
University of Gothenburg	Sweden	3	23
Thamar University	Yemen	2	87
The University of Queensland	Australia	2	86
University of Tlaxcala	Mexico	2	62
University of Bern	Switzerland	2	38
Ondokuz Mayis University	Türkiye	2	38

Table IV - Main authors with the highest number of publications on Cryotherapy

Author	Number of articles	Number of citations	H index	Number of articles at WoS-CC	Number of citations at WoS-CC
Clark, GT	7	92	40	217	4.879
Kuboki, T	7	92	39	278	5.283
Maekawa, K	6	76	16	89	888
Pogrel, M	6	119	44	238	6.227
Nally, F	5	66	12	38	333
Yamashita, A	5	61	20	70	1.257
Emmings, F	4	96	14	49	733

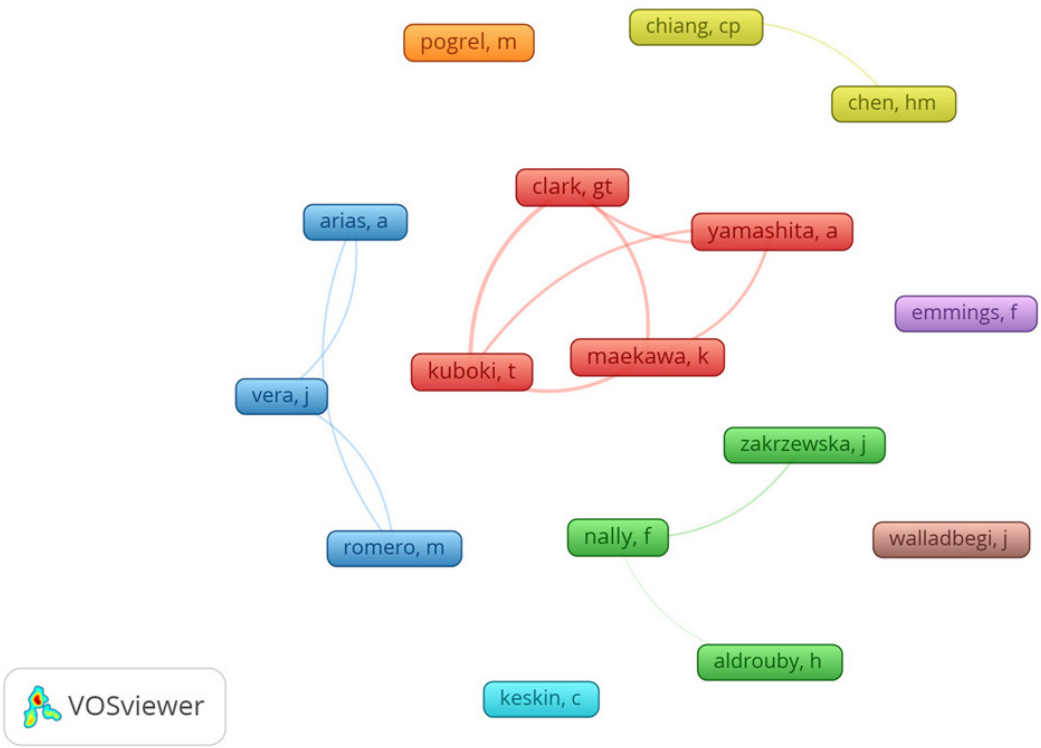


Figure 3 - Collaboration and co-authorship networks among leading authors. Minimum number of occurrences of author: 3 articles. The names written in highlighted font and corresponding to the red and orange colors are associated with the most frequent authors. We can observe the interrelationship between the groups of authors.

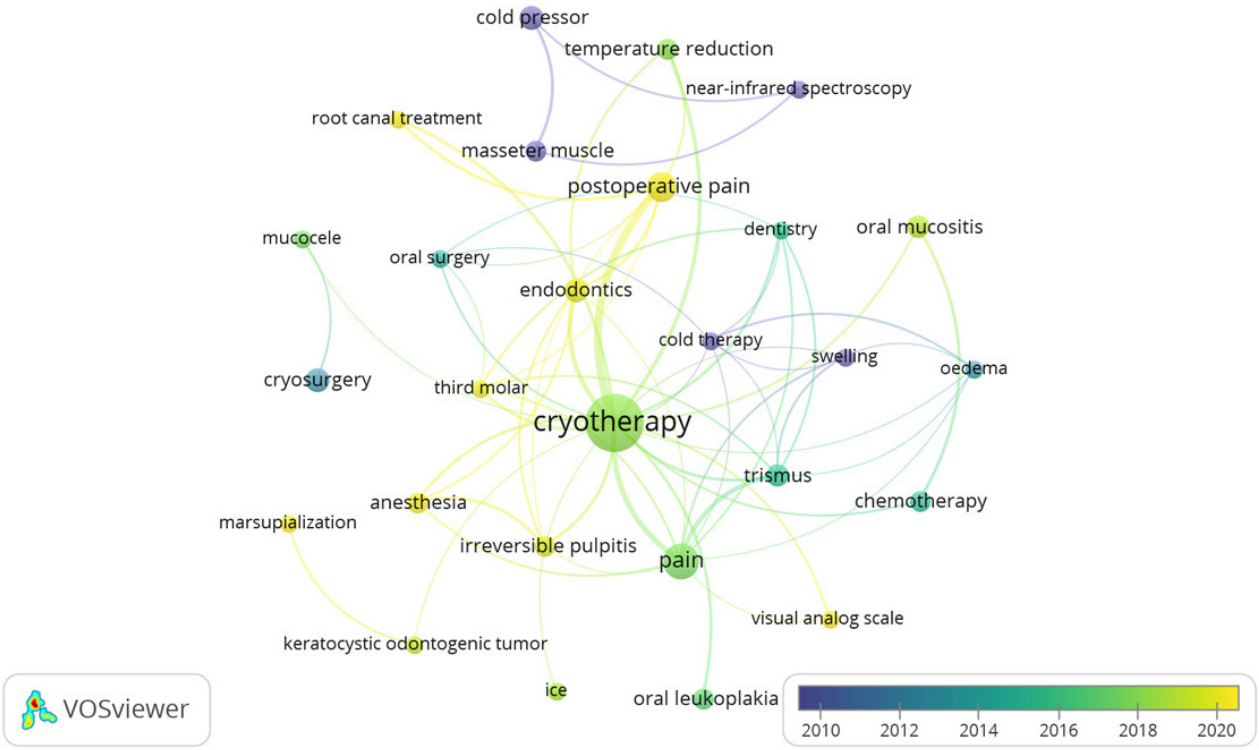


Figure 4 - Description and collaboration among the main keywords. Minimum number of occurrences of the keyword: 3 articles. The larger circles correspond to the most prevalent keywords, while the colors indicate keywords that are commonly used in association.

A total of 282 keywords were identified across the 163 included articles. Among these, the most frequent were "cryotherapy" (46 occurrences), followed by "pain" (14 occurrences) and "postoperative pain" (10 occurrences). The most frequently used keywords (≥3 occurrences) and the collaboration relationships between them are presented in Figure 4.

DISCUSSION

This bibliometric analysis of the literature on the use of cryotherapy in dentistry indicates that the use of low temperatures as a therapeutic strategy has stood out in various specialties of dentistry [23,24], and most studies emphasize the benefits of the use of cryotherapy. This has contributed to a growing number of publications on the topic in recent years, particularly in Asia. The main objective of these studies was to evaluate the efficacy of cryotherapy for analgesia or anesthesia. In this context, the present study analyzed research indexed in the WoS-CC database, a well-established and prestigious source for assessing scientific impact based on citation metrics, enabling the identification of trends and indicators that may support the advancement of knowledge in this field [14,17,25,26].

One of the metrics analyzed was the number of citations, which reflects the relevance of the studies, so much so that studies with more than 100 citations are considered a "classics", given their scientific impact [27]. However, it should be considered that not every citation indicates agreement with the result of the study, as the study may have been cited to highlight the divergences of its findings or methodology. Additionally, factors such as accessibility (e.g., open access status) may influence citation counts [28,29]. Self-citations, which although sometimes associated with inflated bibliometric indicators, can also reflect the sum of an author's production in a specific area and influence the impact factor of journals [30]. In the present study, journal impact factors ranged from 0 to 5.8. In dentistry, journals with an impact factor above 5.0 are considered very relevant [31].

The fact that the article "Oral mucositis" by Scully et al. [20] received the highest number of citations. In addition to its broad accessibility, this may be attributed to its comprehensive and clinically relevant discussion

of a common and debilitating complication of oncological treatments such as chemotherapy and radiotherapy. The high number of citations may also be explained by the fact that it is an older article, with approximately 20 years since publication, which may have provided more time to accumulate citations. In addition, the study had the participation of Stephen Sonis, a world-renowned study of oral mucositis [32] raises the credibility of the publication.

The most prominent journals in the present study were the Journal of Oral and Maxillofacial Surgery, the Journal of Dental Research, and the British Journal of Oral & Maxillofacial Surgery, which may be related to their scopes encompassing articles on the application and development of techniques for dentoalveolar and head and neck surgery, temporomandibular joint disorders, oral cancer, anesthesia and analgesia, pharmacological therapies, and technological innovations. This description confirms the findings of the present study, which, despite having sixty-five different journals, demonstrates that the main dental specialties involved are stomatology/pathology and surgery, which are related in clinical practice, and the most evident themes are analgesia and excision/enucleation, which are also related both to each other and to the specialties highlighted in this review.

Cryotherapy has been the focus of studies in recent years, for example, in the last five years 31.90% of the studies included in this review were concentrated. Of these, twenty-seven address the theme of analgesia and fourteen are related to the area of endodontics. This can be linked to the growing interest in less invasive techniques, for safety for the population with specific needs, or the search for lower costs and greater accessibility to health [1]. Clinically, this non-pharmacological and low-cost technique can act as an adjuvant in treatments improving postoperative sensitivity and other painful conditions related to the orofacial region, thus improving patient comfort. Other themes are addressed in the literature, such as anesthesia and postoperative periods, also aiming at greater patient comfort and the use of non-pharmacological strategies, which suggests that these themes should be addressed in future clinical studies on cryotherapy in different age groups.

It was possible to observe that the scientific progress on the use of cryotherapy in dentistry, in these sixty-one years, was supported mainly by clinical studies in adults, analyzing from postoperative effects to the use of extremely low temperatures in surgeries. Randomized controlled trials, when well designed, are the most appropriate design to evaluate treatments and are also the studies that support clinical decision-making [33]. The large number of clinical trials on this topic reflects the growing interest in evaluating therapeutic applications of cryotherapy.

The study by Sharma et al. [34], which compared the effects of cryotherapy and low-level laser therapy on postoperative symptoms following surgical removal of impacted mandibular third molars, evaluated 80 adult patients undergoing bilateral symmetrical extractions. The authors reported that cryotherapy was more effective in controlling pain and edema, whereas laser therapy showed greater efficacy in reducing trismus. Similarly, the study by Nair et al. [35] evaluated the treatment of odontogenic keratocyst using cryosurgery with refrigerant spray, the same used in pulp vitality test, as an adjuvant and measuring bone formation after 15 months, observed that enucleation followed by cryotherapy combined with gases is a safe therapy, effective and low-cost for the treatment of this lesion. These findings allow us to understand the scope of the clinical applicability of techniques that use low temperatures, although they do not directly reflect clinical effectiveness.

A worldwide disparity in the number of publications can be observed, since 36 countries distributed in six continents were identified in this study. The country with the largest number of studies included in this review was the USA, which corroborates other bibliometric analyses published in the field of dentistry [17,36]. The U.S. is also the most recurrent institution. These findings can be explained by the great encouragement of research in developed countries [37], so much so that among the studies conducted in the USA and included in this review, 22.22% were clinical trials, which are studies with high costs for planning and execution, while underdeveloped countries have a small number of studies.

On the other hand, the continent with the greatest prominence in number of studies was Asia, which can be explained by the increase in the number of open access journals, such as

the Korean Restorative Dentistry & Endodontics and the Saudi Dental Journal. Another reason that may explain Asia's leadership is that the three most prolific authors on the topic are affiliated with Okayama University in Japan, thus contributing to the Asian continent's output. Thus, considering the low cost involved in therapeutic techniques that use extreme cold, more studies are needed, especially in countries where access to the most modern technologies is still impaired. Additionally, this continent has already been highlighted for its number of publications in other bibliometric reviews [15].

Six authors wrote five or more articles among the 163 included, Clark GT, Kuboki T, Maekawa K, Pogrel M, Nally F, and Yamashita A. These authors mainly work with observational studies and clinical trials, evaluating cryotherapy for analgesia for orofacial pain in an adult population. This may reflect that the current findings in the literature reflect results for the adult population with complaints or history of orofacial pain, leaving a gap in other areas of dentistry, regarding the efficacy of different applications of cryotherapy, in different age groups. Future studies should try to fill these gaps, through well-designed clinical trials.

Although this review presents a comprehensive overview of the state of the art of the use of cryotherapy in dentistry, it also has some limitations. By analyzing the results of the WOS-CC exclusively, it may have made it impossible to include relevant studies indexed only in other databases, such as Scopus or Pubmed. In the analysis, the studies were evaluated only quantitatively, without evaluating the methodological quality of the publications. One of the metrics analyzed was the number of citations, which needs to be handled with caution since older articles tend to have a higher number of citations. To minimize this limitation, the citation density was also evaluated, which considers the relationship between the number of citations and the time that the study has been available. In the meantime, authors and institutions with many contributions often have their influence overvalued.

Some strengths of the present study reinforce its relevance and reliability. The WOS-CC database was chosen to search for articles because it is a reliable and complete database, which focuses its database of publications on their quantitative metrics, which allowed a point-by-point analysis, systematically extracting various characteristics of the studies. Furthermore, with a search without time or language restrictions, it was possible to visualize a current panorama of studies on the use of cryotherapy in Dentistry.

This literature review identified important gaps in research, especially the lack of studies focused on hemostasis, cancer treatment, and applications in implant-related procedures and periodontal therapies. Future studies should investigate the potential role of cryotherapy in managing patients with coagulation disorders and those undergoing cancer treatment. The scarcity of studies in pediatric dentistry, despite increasing interest in non-pharmacological approaches for analgesia and anesthesia. Similarly, the predominance of adult populations further highlights the paucity of pediatric-centered evidence, underscoring the need for future clinical trials focused specifically on children. Furthermore, although clinical trials represent high-level primary evidence, the findings of the present study suggest that there is a need for further consolidation of knowledge through well-conducted systematic reviews, preferably with meta-analyses, to assess the methodological quality of existing studies and thus guide clinical practice in a more robust way.

Overall, the studies analyzed predominantly focused on analgesia within the field of oral medicine and in adult populations, reinforcing the need for further research in pediatric dentistry. Most of the papers were published in Asia, and the lead author was Clark GT of the University of California, Los Angeles (UCLA). The United States had the highest number of publications, highlighting the need to encourage research in this area in underrepresented regions such as South America and Africa. This study is of great relevance to dental clinicians, as well as undergraduate and graduate students, as well as to the scientific community in general, since it evaluates the scientific literature on a therapeutic alternative characterized by wide availability, simplicity of the technique and low cost.

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Data availability

The authors declare to provide any data linked to the manuscript upon request.

Author's Contributions

MCG: Conception; acquisition, analysis, and interpretation of data; original drafting; final approval. AOR: Conception; acquisition, analysis, and interpretation of data; original drafting; final approval. IR: Conception; acquisition, analysis, and interpretation of data; original drafting; final approval. LMA: Conception; analysis and interpretation of data; critical revision; final approval. JMG: Original drafting; critical review; final approval. KC: Analysis and interpretation of data; final approval. BMR: Original drafting; final approval. FCV: Conception; analysis and interpretation of data; critical revision; final approval. BH: Analysis and interpretation of data; critical revision; final approval. MC: Conception; analysis and interpretation of data; critical revision; final approval.

Conflict of Interest

No conflicts of interest declared concerning the publication of this article.

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Regulatory Statement

This study did not require approval from an ethics committee as it is a review article and did not involve human or animal subjects. During the preparation of this manuscript, the authors used Grammarly for Grammatical correction of the English language. After using this tool/service, the authors have reviewed and edited the content appropriately and take full responsibility for the content of the publication.

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Supplementary Material

Supplementary material accompanies this paper.

Suppl. Table I - Published articles related to the use of cryotherapy and dentistry.

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