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Short Communication

A scientometric study on research trends and characteristics of burning mouth syndrome

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Abstract *Background/purpose:* Burning mouth syndrome (BMS) is a chronic condition characterized by intraoral burning sensation and orofacial pain but without oral mucosal lesions. The purpose of this study was to analyze the scientometric characteristics and research trends of BMS.

Materials and methods: All the papers on BMS were comprehensively retrieved from the Scopus database. The years of publication were divided into before 2015 and 2015–2024 in the analysis of research trends.

Results: There were 924 papers on BMS, with total citations of 24,024 and the *h* index of 76. The related disorders of BMS were depression, xerostomia, pain, anxiety, glossodynia, taste disorder, nociception, paresthesia, analgesia, sleep disorder, diabetes mellitus, and neuralgia. Clonazepam was most common pharmacotherapy for BMS. After 2015, pharmacologic keywords including drug safety, aripiprazole, duloxetine, folic acid, hydrocortisone, and pregabalin were more frequent. Low level laser therapy, acupuncture, and cognitive behavioral therapy were the emerging nonpharmacologic strategies for BMS. Moreover, laboratory investigations on biomarkers, blood, genetics, interleukin 6, and tumor necrosis factor were more common. Various

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questionnaires, comorbidity, complication, anemia, hypertension, diabetes mellitus, and sleep were also more concerned after 2015.
Conclusion: This scientometric study elucidated the current scenario and research trends of BMS, and would help in improving in reciprocal collaboration and communication for investigations on this condition.

Introduction

Burning mouth syndrome (BMS) is a chronic orofacial pain condition characterized by painful and burning sensation in the mouth but without visible causal oral mucosal lesions.[1] The incidence rate of BMS was reported to be 1.73 % in the general population and 7.72 % among clinical patients, with predominantly affecting middle-aged and elderly women.[2] In addition to oral burning and pain, xerostomia, glossodynia, taste alterations, and dysaesthesia are also described by BMS patients.[1] These symptoms often involve tongue, palate, and lips, mainly anterior two-thirds of the tongue. BMS has great negative impacts on the patient's daily life, predominantly affecting patients' daily activity as eating and speaking.[3] The etiopathogenesis of BMS remains unclear and may be associated with a combination of oral local, psychosocial, and nervous systemic factors.[4] Because of the uncertain aetiology, the treatment (pharmacologic or nonpharmacologic) of BMS is diversity and their effectiveness are unsatisfactory.[5–7]

Despite there have been hundreds of the papers regarding the field of BMS, gaps remain in its etiopathogenesis and treatment challenge clinical practice.[4] Scientometrics is a useful tool that utilizes citation and bibliometric data to measure scientific output and research trend of a specific research field.[8–10] Conducting a scientometric analysis is imperative to elucidate the foundational structure and emerging hotspots of BMS research. There had been 2 previous bibliometric analyses of BMS,[11,12] but lack of scientometric analysis was conducted to focus on the keywords that can reflect research directions and topics of concern. To develop a better comprehensive understanding of the pathogenesis and therapeutic interventions of BMS, this study thus aimed to analyze the scientometric characteristics and research trends of BMS with emphasis on chronological comparison of the keywords, so as to provide helpful guidance for further research.

Materials and methods

As per the methodology described previously,[9,10] all the papers on BMS in the Scopus database were retrieved on 01 Jan 2025. We used medical subject terms "burning mouth syndrome" in the Title in literature search, without restriction to paper type and year of publication. Only English literature was included because it is an international knowledge-exchange language. The scientometric characteristics of all the eligible papers were recorded for the following information: title, keyword, citation count, publication year, journal of publication, authorship, affiliation, and country/region of origin. Data search and extraction were performed independently by two investigators, and any discrepancy of results was resolved in a consensus symposium. The years of publication were divided into before 2015 and 2015–2024, so that the number of papers can be to some extent compared in the analysis of research trends. Microsoft Office Excel 365 was used for index model building, and the Bibliometrix Biblioshiny R-package software was used for bibliometric statistics. In this descriptive study, variables were presented as numbers and percentages. No comparisons were made, and thus no *P*-values were set.

Results

Citation characteristics

With the search strategy algorithm, a total of 924 English papers on BMS were retrieved in the Scopus database. As presented in Fig. 1A, the most type of papers on BMS was article (n = 626), followed by review (n = 159) and letter (n = 84). The total citation count (after removal of self-citations) was 24,024 (22,047) and the *h* index was 76 (74) for all the papers. To further concretize the trends of scientific output, we assessed the annual number and accumulated citations of the papers during 2005–2024 (Fig. 1B). The annual number of the papers on BMS stably raised from 18 to 73 during 2005–2024. The accumulated citations (after removal of self-citations) of the papers increased from 361 (340) to 1822 (1616) during 2005–2024. The detailed information on publication year, authors, title, abstract, journal of publication, citation count, institutions, keywords, and paper type of the 100 most-cited papers are presented in Supplementary Table S1.

Bibliometric characteristics

Fig. 1C displays cloud graphs of journals of publications, contributing authors, institutions, and countries/regions of origin of the papers on BMS, which were divided into before 2015 (411 papers) and 2015–2024 (513 papers), so that the number of papers can be to some extent compared in the analysis. Before 2015, the journal of publication, contributing author, institution and country of origin with largest number of papers was *Journal of Oral Pathology & Medicine*

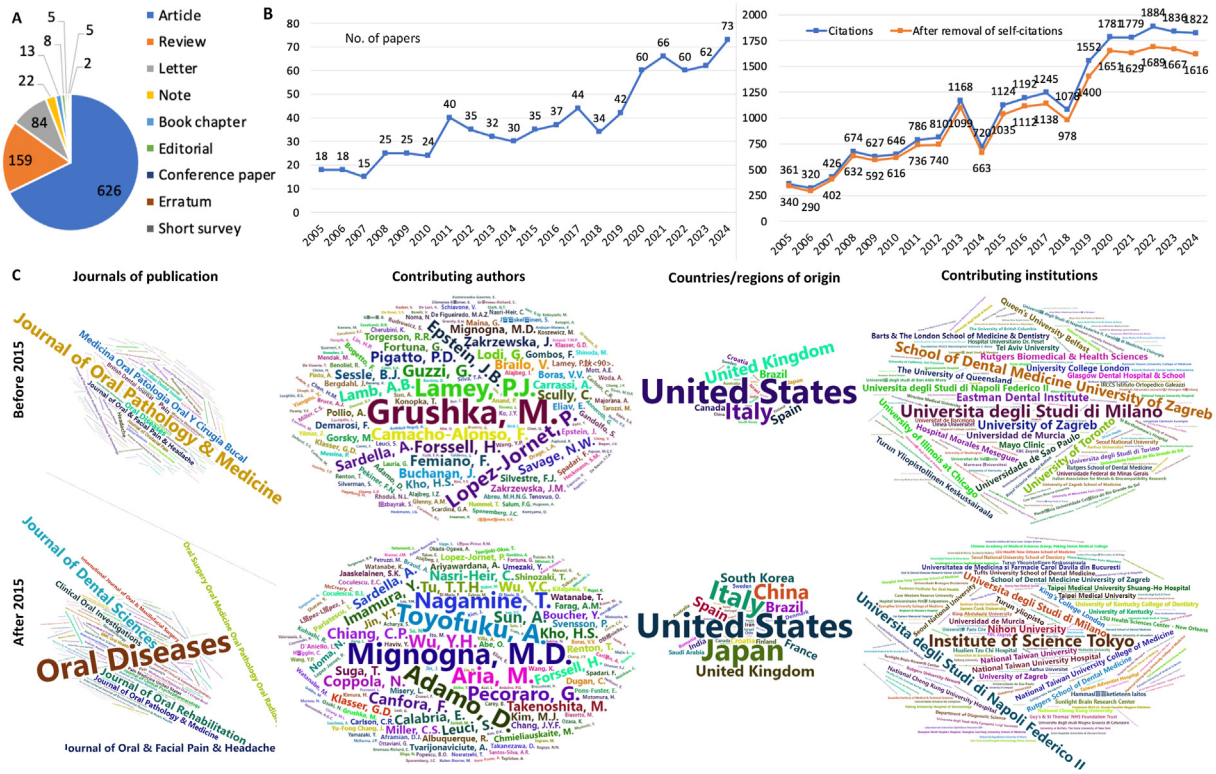

Figure 1 Bibliometric characteristics of the papers on BMS. (**A**) The numbers of different paper types. (**B**) The annual number and accumulated citations of the papers during 2005—2024. (**C**) Cloud graphs of journal of publication, contributing authors, countries and institutions of origin regarding BMS papers before 2015 and 2015—2024. The font size indicates the number of papers; a larger size means more papers in the cloud graphs.

(n = 29), Grushka, M. (n = 18), Università degli Studi di Milano (n = 17) and United States (n = 85), respectively. After 2015, the journal of publication, contributing author, institution and country of origin with maximum number was *Oral Diseases* (n = 49), Mignogna, M.D. (n = 24), Institute of Science Tokyo (n = 31) and United States (n = 81), respectively. Supplementary Table S2 presents the journals, contributing authors, institutions, and countries/regions with largest number of papers (rank, 1—10).

Research characteristics

The research keywords of all the papers on BMS were visualized through the cloud graphs (Fig. 2A). The related disorders of BMS were depression, xerostomia, pain, anxiety, glossodynia, mouth pain, neuropathic pain, taste disorder, dysgeusia, stomatodynia, anxiety disorder, nociception, orofacial pain, headache, paresthesia, analgesia, face pain, sleep disorder, diabetes mellitus, and neuralgia (Fig. 2B). The main therapy for BMS were pharmacologic treatment, such as clonazepam, capsaicin, thioctic acid, amitriptyline, gabapentin, paroxetine, duloxetine, sertraline, pregabalin, benzydamine, cyanocobalamin, folic acid, amisulpride, nortriptyline, and trazodone. Besides, cognitive behavioral therapy, low level laser therapy, and acupuncture therapy were the non-pharmacologic strategies for BMS (Fig. 2C). As for the main keywords, there have always been the common keywords such as controlled study, clinical article, treatment outcome, pathophysiology, pain measurement, visual analog scale, tongue, quality of life, saliva, burning sensation, and differential diagnosis.

The more frequent keywords in different years can basically reflect research trends of BMS (Fig. 2D). Before 2015, disease classification, risk factors, age factor, sex factor, menopause, hormone substitution, denture, trigeminal nerve, and patch test were more frequent. Therapy aspect focused on pharmacotherapy including amisulpride, antifungal agent, trazodone, candidiasis, antioxidants, corticosteroid, benzodiazepine derivative, chlordiazepoxide, diazepam, sertraline, and GABA modulators. After 2015, clinical studies on cohort analysis, cross-sectional study, comorbidity, complication, numeric rating scale, depression rating scale, quantitative sensory testing, hospital anxiety & depression scale, McGill pain questionnaire, Pittsburgh sleep quality index, nuclear magnetic resonance imaging, medical history, and sleep quality were more common. Laboratory investigations on biomarkers, blood, genetics, interleukin 6, tumor necrosis factor, and iron were more frequent. Pharmacologic keywords including drug safety, aripiprazole, duloxetine, folic acid, hydrocortisone, and pregabalin were more common. The related disorders including analgesia, anemia, diabetes mellitus, dysesthesia, paresthesia, hypertension, hyposalivation, nausea, neuralgia, and sleep disorder were more common. Moreover, low level laser therapy, acupuncture, and cognitive behavioral therapy were the emerging non-pharmacologic strategies for BMS after 2015.

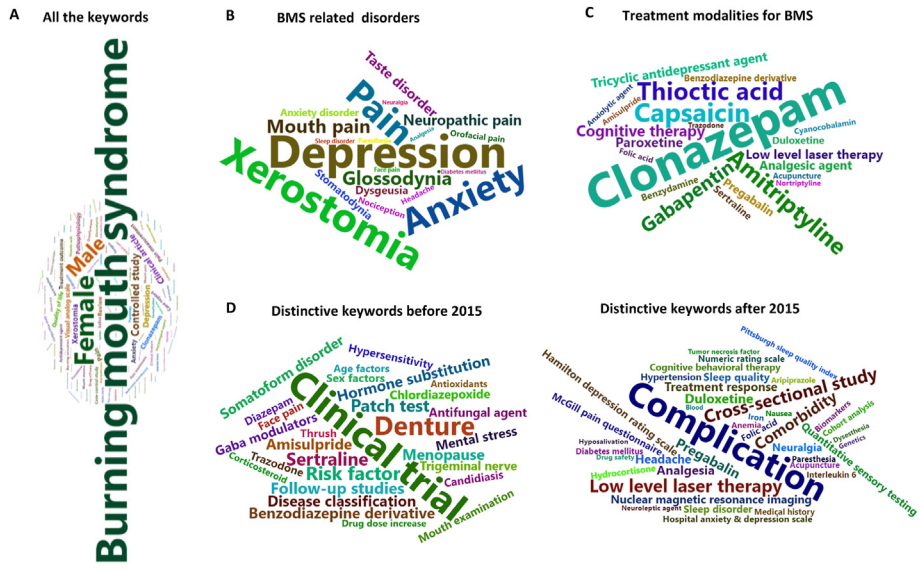

Figure 2 Research characteristics of the papers on BMS. Cloud graphs of (**A**) all the keywords, (**B**) the related disorders, (**C**) the treatment modalities (pharmacologic or nonpharmacologic), (**D**) distinctive keywords of papers published before 2015 and after 2015. The font size indicates the number of papers; a larger size means more papers in the cloud graphs.

Discussion

BMS was defined by the International Association for the Study of Pain (IASP) as a chronic intraoral burning sensation that has no identifiable cause either local or systemic condition or disease.[1] This scientometric study attempted to analyze the characteristics and research trends of all the English papers on BMS since 1941 retrieved from the Scopus database. The 2 previous bibliometric studies only analyzed the original articles and reviews on BMS retrieved from Web of Science database limited a period (2003–2023 or 2008–2023).[11,12] The advantage of the Scopus database can automatically exclude self-citing, and provide more coverage than Web of Science.[13] We found the increasing annual number and citations of the papers on BMS suggest that it has governed increasing attention and investigation. Bibliometric characteristics of papers on BMS including journals of publications, contributing authors, institutions and countries of origin were identified in sequence. These would aid clinicians and investigators in choosing target journals, finding potential collaborators or partner institutions, as well as promoting mutual understanding and more reciprocal cooperation regarding BMS research.

In this study, it is noteworthy that we provide knowledge domains mappings of the related disorders and treatment modalities for BMS. The domains of the related disorders, e.g. xerostomia, denture, dysgeusia, depression, anxiety, neuropathic pain, and neuralgia, largely reflected that BMS was associated with oral local, psychosocial, and nervous systemic factors,[14–16] thereby necessitating interdisciplinary research approaches that bridge oral medicine, psychological, and neurological studies. Importantly, the domains of treatment modalities showed that clonazepam was most common pharmacotherapy for BMS. In a network meta-analysis, Alvarenga-Brant et al.[5] concluded that only clonazepam was likely to reduce the pain of BMS when compared with placebo among all tested treatments. Another strength of this study was to perform the chronological comparison (before 2015 versus after 2015) of the keywords based on all the papers on BMS. After 2015, laboratory investigations on biomarkers, blood, genetics, interleukin 6, and tumor necrosis factor were more common.[17–19] Various questionnaires, anemia, comorbidity, complication, hypertension, diabetes mellitus, and sleep were also more concerned. Moreover, we observed that low level laser therapy, acupuncture, and cognitive behavioral therapy were the emerging nonpharmacologic strategies for BMS after 2015.[20,21]

In summary, this scientometric study on BMS elucidated the current scenario and research trends in the field of this disorder. Oral medicine, psychological, and neurological clinicians understanding the more knowledge domains can have a beneficial impact on BMS patients. Finding the scientometrics would elucidate the comprehensive identification and recognition of the important research topics concerned, and help in improving in reciprocal collaboration and communication for investigations on BMS.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jds.2025.01.009.

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