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Short Communication

A scientometric study on research trends and characteristics of salivary adenoid cystic carcinoma

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Abstract *Background/purpose:* Salivary adenoid cystic carcinoma (SACC) affects the major salivary glands and minor salivary glands mainly within the oral cavity. The purpose of this study was to analyze the scientometric characteristics and research trends of SACC.
Materials and methods: All the papers on SACC 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 2406 papers on SACC, with total citations of 54,921 and the *h* index of 97. Cancer surgery, radiotherapy, chemotherapy, cisplatin, doxorubicin, neck dissection, and combined modality therapy were the main keywords of treatment. The trend of clinical study on cell differentiation, doxorubicin, and fluorouracil has changed to clinical trial, cohort analysis, diagnostic imaging, positron emission tomography-computed tomography (PET-CT), intensity modulated radiation therapy, neck dissection, and surgical margin after 2015. The trend of laboratory investigation on cancer cell culture, cytology, protein S100, and flow cytometry has changed to epithelial mesenchymal transition, fluorescence in situ hybridization, gene fusion, microRNA, MYB, protein Myb, protein p63, and signal transduction after 2015.
Conclusion: This study for the first time elucidated the current scenario and scientometric characteristics of SACC, and would help in improving in reciprocal collaboration and provide helpful guidance for further research.

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Introduction

Adenoid cystic carcinoma (ACC) is a rare, slow growing, malignant epithelial tumor, and accounts for 1 % of all head and neck cancers.[1] Salivary ACC (SACC) affects the major salivary glands mainly being submandibular and parotid glands and minor salivary glands mainly within the oral cavity.[1,2] The etiology and pathogenesis of SACC remain poorly understood. It exhibits a propensity for perineural invasion, local recurrence, and distant metastases commonly to the lungs and bones, which may manifest years even after definitive treatment.[3–5] Radical surgical resection of the tumor with tumor-free margins remains the gold standard in treating SACC, and followed by postoperative radiotherapy especially when radical resection can be difficult to achieve.[1,3] Chemotherapy is typically considered for advanced or metastatic cases, but its efficacy is generally limited. Overall, current treatment options for SACC are limited and often prove unsatisfactory.[1]

Despite numerous studies regarding the field of SACC conducted thus far, gaps remain in its etiopathogenesis and treatment challenge clinical practice.[1] Scientometrics is a useful tool that utilizes citation and bibliometric data to measure scientific output and research trend of a specific research field.[6,7] Conducting a scientometric analysis is imperative to elucidate the foundational structure and emerging hotspots of SACC research. The previous bibliometric analyses focused on head and neck squamous cell carcinoma,[8–10] with no relevant study on head and neck ACC. To develop a better comprehensive understanding of the pathogenesis and management strategies of this carcinoma, the current study thus aimed to analyze the scientometric characteristics and research trends of SACC 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,[6,7] all the papers on SACC in the Scopus database were retrieved on 10 Feb 2025. We used medical subject terms "adenoid cystic carcinoma" in the title and "saliva OR gland OR head OR oral" in the title/abstract/keyword 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 2406 English papers on SACC were retrieved in the Scopus database. As presented in Fig. 1A, the most type of papers on SACC was article (n = 2142), followed by review (n = 122) and letter (n = 71). The total citation count (after removal of self-citations) was 54,921 (51,505) and the *h* index was 97 (94) 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 SACC stably raised from 50 to 140 during 2005–2024. The accumulated citations (after removal of self-citations) of the papers increased from 700 (657) to 4348 (4096) 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 SACC, which were divided into before 2015 (1228 papers) and 2015–2024 (1179 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 *Cancer* (n = 47), El-Naggar, A.K. (n = 18), University of Texas MD Anderson Cancer Center (n = 50) and United States (n = 363), respectively. After 2015, the journal of publication, contributing author, institution and country of origin with maximum number was *Oral Oncology* (n = 35), Ferrarotto, R. (n = 17), University of Texas MD Anderson Cancer Center (n = 42) and China (n = 358), respectively. Supplementary Table S2 presents the journals, contributing authors, institutions, and countries/regions with largest number of papers (rank, 1–10).

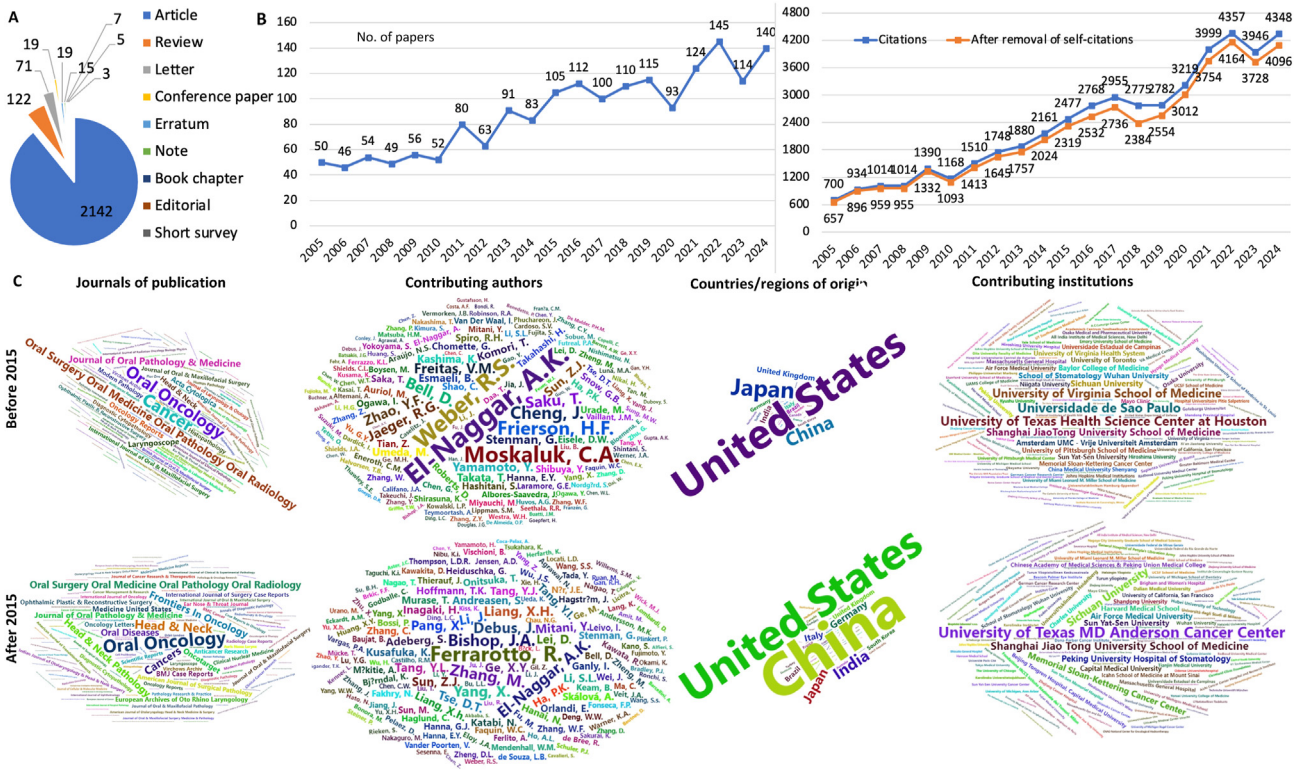

Figure 1 Bibliometric characteristics of the papers on salivary adenoid cystic carcinoma (SACC). (**A**) The numbers of different paper types. (**B**) The annual number and accumulated citations of the papers during 2005–2024. (**C**) Cloud graphs of journal of publication, contributing authors, countries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

Research characteristics

Based on the frequency of the keywords in all the papers on SACC (Fig. 2A), a list of the common keywords is automatically recognized by the database. The most keyword of study design was controlled study, followed by retrospective study, follow-up study, and in vitro study. The keywords salivary gland, submandibular gland, parotid gland, minor saliva gland, and lacrimal gland were the sites of SACC involved. Pleomorphic adenoma and lung neoplasms were the keywords of differential diagnosis. Cancer surgery, radiotherapy, chemotherapy, cisplatin, doxorubicin, neck dissection, and combined modality therapy were the keywords of treatment. Before 2015 and 2015–2024, there have always been the same common keywords such as pathology, immunohistochemistry, metabolism, protein expression, genetics, prognosis, lymph node metastasis, lung metastasis, cell proliferation, cancer recurrence, tumor marker, stem cell factor, protein p53, and perineural invasion. Based on the keywords of papers on SACC published in different years (Fig. 2B), the more common keywords can basically reflect research trends.

Before 2015, the keywords of clinical study such as cell differentiation, pharynx, pleomorphic adenoma, aspiration biopsy, combined modality therapy, doxorubicin, and fluorouracil were more frequent. The keywords of laboratory investigation such as cancer cell culture, cancer invasion, cytology, cystadenocarcinoma, basal cell carcinoma, myoepithelium cell, protein S100, electron microscopy, and flow cytometry were more common. After 2015, the keywords of clinical study such as clinical trial, cohort analysis, clinical outcome, outcome assessment, progression free survival, bone metastasis, fine needle aspiration biopsy, intensity modulated radiation therapy, neck dissection, diagnostic imaging, positron emission tomography-computed tomography (PET-CT), and surgical margin were more frequent. The keywords of laboratory investigation such as carcinogenesis, cell invasion, cell migration, cell motion, cell movement, epithelial mesenchymal transition, microRNA, fluorescence in situ hybridization, gene fusion, gene overexpression, MYB, protein Myb, protein p63, and signal transduction were more common.

Discussion

SACC predominantly originates in the salivary glands, accounting for approximately 75 % of all the cases of ACC.[1] We identified the keywords of SACC involving locations, differential diagnosis, treatment modalities, and common keywords such as perineural invasion, lung metastasis, p53, genetics, and tumor marker.[11–13] These would provide a better comprehensive understanding of the pathogenesis and management strategies of this carcinoma. Also, we found that the steady increasing trend in the number and citations of international publications indicates that the field of SACC is a promising field, which continues to attract the attention of international investigators. Especially in the

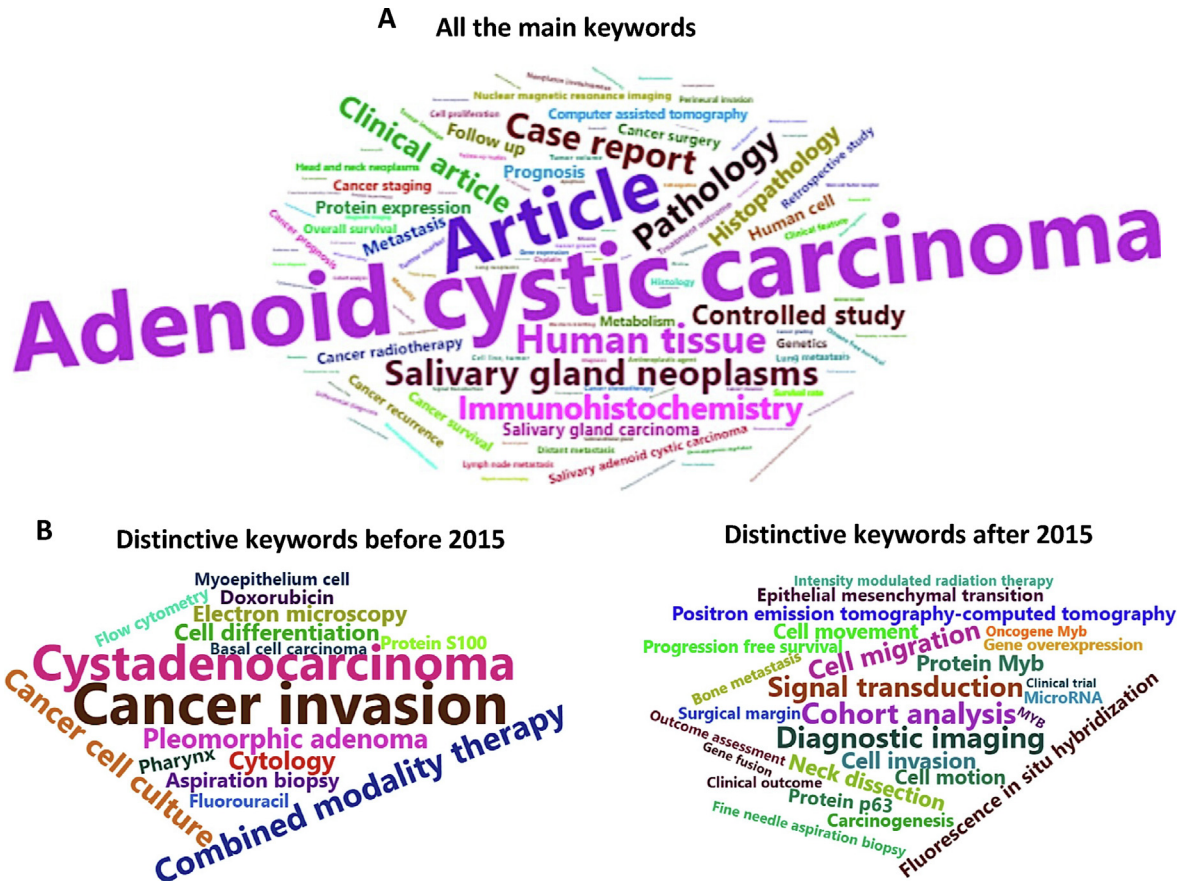

Figure 2 Research characteristics of the papers on salivary adenoid cystic carcinoma (SACC). Cloud graphs of (**A**) all the keywords, and (**B**) distinctive keywords of papers published before 2015 and after 2015. The font size indicates the number of papers; a larger size means more papers in the cloud graphs.

last decade, the number of papers was approximately equal to that before 2015, indicating that research on SACC is undergoing a rapid developmental stage. Bibliometric characteristics of papers on SACC 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 SACC research.

In this study, it is noteworthy that we perform the chronological comparison (before 2015 versus after 2015) of the keywords based on all the papers on SACC. The trend of clinical study on cell differentiation, doxorubicin, and fluorouracil has changed to clinical trial, cohort analysis, diagnostic imaging, PET-CT, intensity modulated radiation therapy, neck dissection, and surgical margin after 2015. Since there is no effective systemic therapy for SACC, especially in advanced stages or for inoperable tumors, more clinical trial and cohort analysis were conducted to explore new treatment strategies,[1] especially those incorporating targeted therapies in the last decade.[14–16] The trend of laboratory investigation on cancer cell culture, cytology, protein S100, and flow cytometry has changed to epithelial mesenchymal transition, microRNA, fluorescence in situ hybridization, gene fusion, MYB, protein Myb, protein p63, and signal transduction after 2015. Of these, the oncogene MYB and MYB-NFIB gene fusion serve a molecular hallmark of ACC and play a key role in the pathogenesis, as it promotes tumorigenesis by enhancing cancer stemness.[17,18] Moreover, targeting cancer stemness with Bmi-1 inhibitors ablated chemoresistance and prevented tumor relapse of SACC, suggested it could act as a promising therapeutic target for SACC.[19,20]

In summary, this scientometric study for the first time elucidated the current scenario and research trends in the field of SACC. Regarding the weakness of the current study, we only searched all the English papers from the Scopus database and thus may overlook important research published in other languages and other databases. Moreover, the more recent papers could not accumulate a large number of citations at the time of this study. Overall, 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 SACC.

Declaration of competing interest

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

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jds.2025.03.004.

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