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Visualization of Emerging Trends and Hotspots in Immunotherapy for Glioblastoma: A Bibliometric Analysis (2000–2024)

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Abstract

Introduction: Glioblastoma (GBM) is a highly aggressive and recurrent primary tumor of the central nervous system with a poor prognosis. This study conducts a comprehensive bibliometric analysis to map research trends and collaborations in GBM immunotherapy, aiming to construct a systematic knowledge framework to inform future research directions and strategic planning in the field.

Methods: A comprehensive search was conducted in the Web of Science Core Collection (WoSCC) database for analyses focused on immunotherapy for GBM from 2000 to 2024. CiteSpace software was used to visualize and analyze the data, which includes countries/regions, institutions, and authors, and to identify the co-occurrences, clusters, and trends of references and keywords.

Results: A total of 3363 publications concerning immunotherapy for GBM were included in our research. There was a yearly increase in the volume of publications. Most researchers who contribute to these publications are American, Chinese, and German. The University of California System was the leading institution in terms of publication output. Co-occurrence and clustering analyses of references and keywords highlighted the stimulatory effects of various therapies on the tumor microenvironment and their impact on patient survival. Keyword analysis identified 'tumor microenvironment', 'landscape', 'immune infiltration', and 'mechanisms' as emerging areas of interest.

Discussion: This study presents a bibliometric analysis of immunotherapy for GBM based on publications from the WoSCC database (2000–2024). We mapped global collaboration networks and identified key research trends, emerging disciplines, and major hotspots in the field.

Conclusion: Over the past two decades, immunotherapy has shifted toward precision and personalization, yielding encouraging progress. In numerous studies, neoadjuvant therapies targeting immune checkpoints have demonstrated partial survival benefits and therapeutic advantages. Future research may focus on exploring more rationally designed combination immunotherapy strategies to improve patient benefit.

Keywords: CiteSpace; Glioblastoma; bibliometric; central nervous system; immunotherapy; neoadjuvant.

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