Letter to Editor

A Bibliometric Analysis of Research on Stroke and Gut Microbiota (2010-2024)

Dear Editor

Stroke, as the second leading cause of death and the third leading cause of disability worldwide, poses an increasingly heavy disease burden. Between 1990 and 2019, global stroke incidence increased by 70%, the mortality rate increased by 43%, and disability-adjusted life years (DALYs) increased by 143%. Notably, 86% of stroke-related deaths and 89% of the DALYs were concentrated in low- and middle-income countries.[1, 2]

Recent studies have established that gut microbiota dysbiosis in stroke patients influences disease progression via the “microbiota-gut-brain axis”. This dysbiosis is characterized by a decrease in beneficial bacteria and an increase in pathogenic species, leading to the accumulation of pro-inflammatory metabolites and exacerbated neuroinflammation. While probiotic supplementation and dietary intervention indicated potential in modulating the microbiota and mitigating brain injury, clinical translation is challenged by individual variability. Future research should integrate multi-omics technologies to advance the development of precision treatments.[3, 4] Due to the significance of this topic, this study addressed a current gap by conducting a comprehensive, global bibliometric analysis of research on stroke and gut microbiota. This study aimed to help researchers quickly grasp the knowledge structure, identify current research concerns, and generate novel research ideas.

We searched the Web of Science Core Collection database for literature related to stroke and gut microbiota from 2010 to 2024 using a structured search strategy. The search terms included “gut flora”, “gut microbiota”, and “gut microbiome”, combined with “stroke”. Using defined inclusion criteria, the selection was limited to original research articles published between January 2010 and December 2024, excluding reviews, conference papers, book chapters, and other non-article types. A total of 457 relevant articles were ultimately included for analysis.

This paper adopted bibliometric methods, utilizing VOSviewer (version 1.6.20; Centre for Science and Technology Studies, Leiden University, Netherlands) to visualize co-occurrence networks of countries and keywords. Concurrently, CiteSpace (version 6.3.R3, designed by Dr. Chaomei Chen, Drexel University, USA) was used to identify research frontiers and development trajectories through citation network analysis and cluster analysis.[5]

Our analysis revealed a significant growth trend in this field. By formulating strict retrieval strategies and screening criteria, a total of 457 research papers were ultimately included, revealing a significant development trend in the field of stroke and gut microbiota research. The annual publication count increased from 1 in 2010 to 111 in 2024. This continuous growth reflects the academic community’s deepening interest in the role of the gut microbiota in stroke pathophysiology (figure 1).

Research on stroke and gut microbiota involved 46 countries and regions worldwide. This study identified the top 10 most prolific countries (table 1). Among them, China (n=278) ranked first in the number of published papers, followed by the United States (n=102) and Germany (n=20). Notably, China and the United States not only lead in output but also in academic influence, with cumulative citation frequencies of 5,670 and 14,510, respectively, far exceeding those of other countries. This data fully demonstrated the dominant position of the two countries in this research field and their broad international recognition in this field.

Keyword cluster analysis identified eight main directions, including risk factors, dairy products, age-related neuropathy, reperfusion injury, ischemic stroke, gut microbiota, short-chain fatty acids, and the gut-brain axis. The co-occurrence analysis of high-frequency keywords—including “gut microbiota” (n=258), “stroke” (n=162), and “inflammation” (n=82)—highlighted current research hotspots. The trend indicated a shift from early risk factor analysis toward exploring deeper biological mechanisms, such as microbial metabolites and gut-brain axis signaling. A strong correlation was observed among clusters #2–5 (figures 2, 3, and table 2).

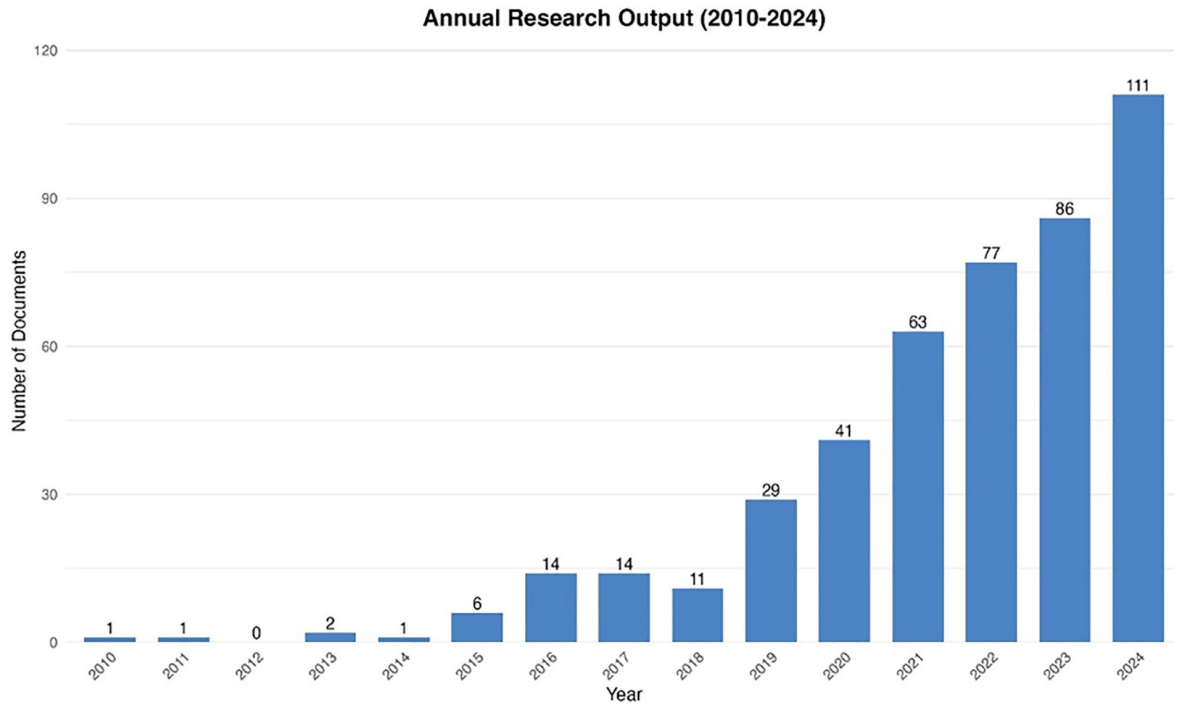

Figure 1: The top 10 journals that published the most articles on stroke and gut microbiota (2010-2024).

Table 1: Top 10 countries in terms of production in areas related to stroke and gut microbiota

Country	Documents	Citations	Total link strength
China	278	5670	58695
USA	102	14510	44885
Germany	20	1506	12322
Australia	16	1284	8628
Japan	16	1118	4624
England	14	1618	8544
South Korea	13	258	5440
Canada	10	451	6383
Poland	9	76	2076
Switzerland	10	567	7073

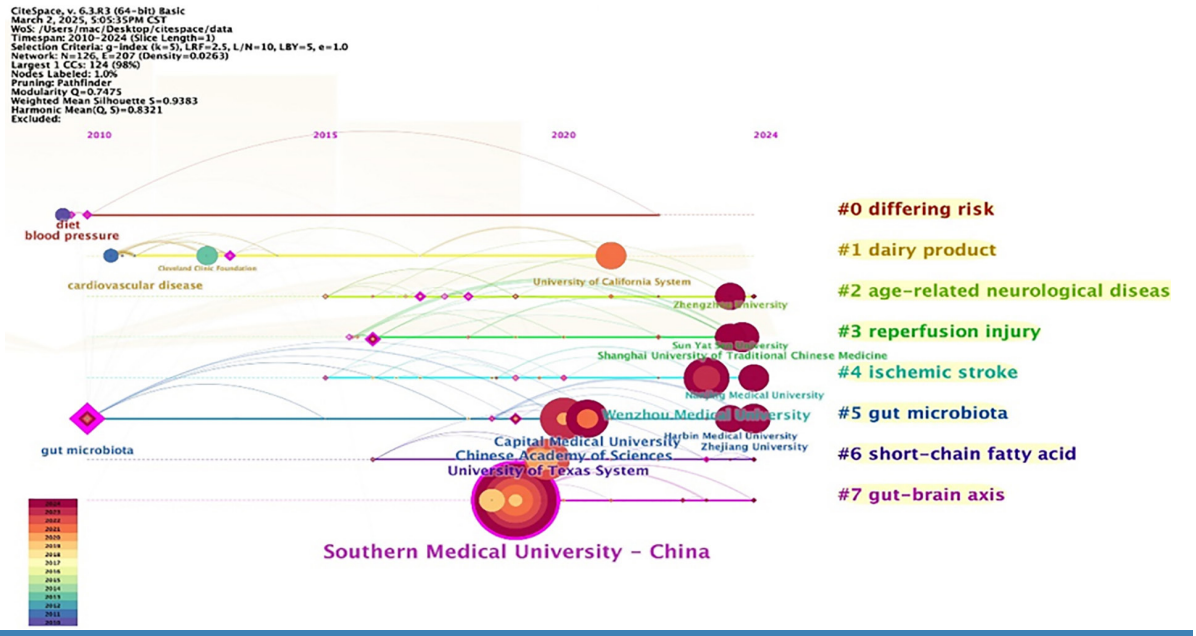

Figure 2: The figure shows the utilization of keywords by institutions across different years and keyword clustering analysis.

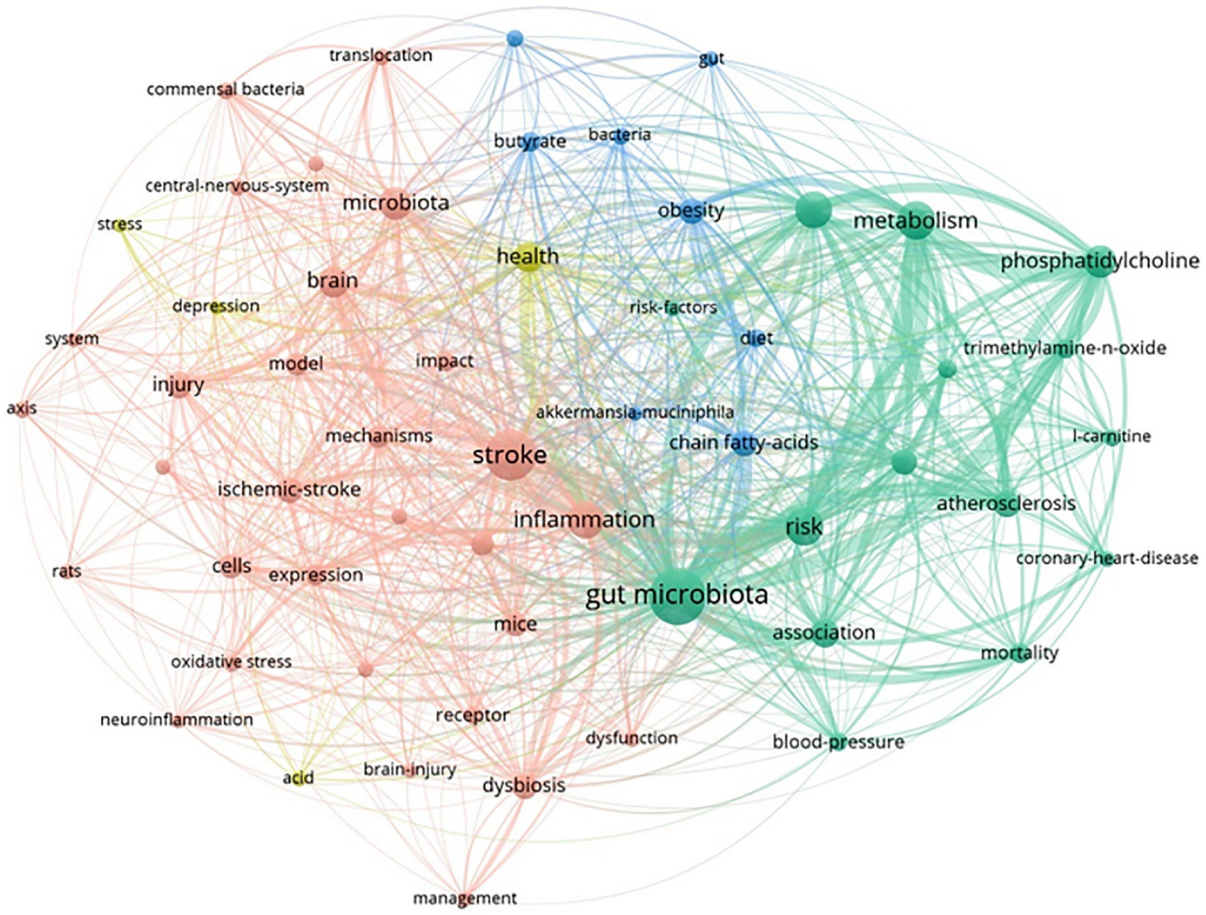

Figure 3: The diagram illustrates the co-citation relationships among keywords related to miRNA research in cervical cancer.

Table 2: Top 20 keywords in the literature on stroke and gut bacteria

Keyword	Occurrences	Total link
Gut microbiota	258	929
Stroke	162	605
Inflammation	82	356
Ischemic stroke	80	296
Metabolism	64	279
Microbiota	63	255
Risk	58	247
Disease	52	238
Phosphatidylcholine	43	201
Brain	43	164
Dysbiosis	42	199
Health	36	141
Atherosclerosis	35	161
Intestinal microbiota	34	171
Association	34	149
Obesity	31	137
Injury	29	113
Gut microbiome	29	98
Chain fatty-acids	27	130
Mice	27	117

Recent years have seen substantial progress in understanding the role of gut microbiota in stroke pathophysiology. Research has elucidated the complex mechanisms by which the microbiota-gut-brain axis influences stroke onset and progression through neurological, endocrine, and immune pathways.

Evidence indicates that gut microbiota-derived metabolites (such as short-chain fatty acids and secondary bile acids) can regulate intestinal barrier function and systemic immunity, and also directly affect brain function through pathways such as the vagus nerve. Dysregulation of this bidirectional network is closely linked to stroke risk and prognosis.[6-8]

In summary, this bibliometric analysis reviewed research trends in stroke and gut microbiota from 2010 to 2024. By revealing a paradigm shift from risk factor association to mechanistic exploration, this study provided a foundation for the optimal allocation of research resources and for guiding future innovative breakthroughs.

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Authors' Contribution

All authors contributed to the conception and design of the work, investigation, data interpretation, and drafting and reviewing the manuscript. C.C.: Supervised the project. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declaration of AI

The authors declare that no AI tools were used in the preparation of this manuscript.

Conflict of Interest: None declared.

Keywords ● Gut microbiota ● Stroke ● Microbiota-gut-brain axis ● Bibliometric analysis

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