Original Article

A scientometric mapping of sugar and cancer growth: Dynamism, visualization, and emerging patterns

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Abstract

Background: This bibliometric analysis was designed to evaluate academic production regarding the effect of sugar on the growth of cancer in documents published since January 2019 and until January 2025. **Materials and Methods:** The bibliometric analysis included all documents indexed in Scopus with search criteria pertaining to sugar and cancer growth in the title or abstract, and published from January 2019 onward. Documents that did not indicate either criteria, duplicates, opinion pieces, editorials, conference abstracts, or those published in a language other than English would be excluded. The search process was conducted on January 9, 2025, using a specific search formula. The data were analyzed using Scopus, SciVal, Bibliometrix, and VOSviewer. **Results:** A total of 283 documents were evaluated, originating from 214 source publications. Over time, the annual rate of document production showed a decline of 29.65%. On average, authors in this research field remained active for 3.28 years, and each document received approximately 16.95 citations. Harvard University and Zhejiang University produced the most documents, followed by Lewis C. Cantley from Cornell University. The prominent journals were *Cell Metabolism* and *Oncogene*. The area of study remained focused on dietary causes related to cancer, with issues related to the keyword search of "metabolism," "mouse," "genetics," and "carcinogenesis." Remarkably, thematic evolution was captured along with the collaborations of international researchers, providing evidence of a global research network on the topic. **Conclusion:** This research is important for the identification of trends and priorities in cancer research and for informing future studies and public health policies. The results can be used to improve the prevention, diagnosis, and treatment of cancer by maximizing resources and efforts in critical and emerging areas of cancer research.

Keywords: cancer growth, cancer, sugar, scientometrics

Introduction

In recent years, the relationship between dietary sugar intake and cancer development has generated growing concern in the scientific community.[1] Natural sugars are found in whole foods such as fruits, vegetables, and dairy products.[2] In contrast, added sugars are found in processed foods, baked goods, sweets, and sugary drinks, and therefore lack essential nutrients.[3] In addition, excessive intake of these sugars has been associated with an increased risk of obesity, dental caries, and various noncommunicable diseases such as type 2 diabetes, heart disease, and cancer.[4]

In addition, the consumption of simple sugars, especially added fructose, has increased in recent decades due to the widespread intake of sugar-sweetened beverages.[5] Therefore, numerous epidemiological and nutritional studies have analyzed the impact of sugar on the occurrence and progression of cancer.[6] The idea that sugar contributes cancer development is based on several biological processes. A high carbohydrate intake can increase

Access this article online

Quick Response Code:

Website: www.ijnpnd.com

DOI: 10.4103/ijnpnd.ijnpnd_105_25

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Received: 21 May 2025 **Revised:** 6 July 2025
Accepted: 11 July 2025 **Published:** 30 August 2025

How to cite this article: Alvitez-Temoche D, Silva H, Yaranga N, la Cruz MH-De, Espinoza-Carhuancho F, Cabanillas-Lazo M, Mayta-Tovalino F. A scientometric mapping of sugar and cancer growth: Dynamism, visualization, and emerging patterns. Int J Nutr Pharmacol Neurol Dis 2025;15:330-7.

blood glucose levels and lead to insulin resistance, which may stimulate cancer cell proliferation.[7]

Recently, researchers have identified several types of cancer related to sugar consumption.[6] In addition, multiple studies have assessed the impact of various dietary factors.[8] One study demonstrated that a higher intake of sugar was associated with an increased risk of cancer and specifically breast cancer, regardless of weight gain or weight status.[9] Sugar may increase the risk of colorectal cancer by promoting obesity, type 2 diabetes, and insulin resistance.[10] Recently, impacts specific to high sugar consumption scenarios have been noted, with particular mention of high fructose consumption on colorectal cancer, pancreatic cancer, and other cancers related to adiposity.[5,11] A recent meta-analysis of 27 observational studies indicated a robust association between sugar-sweetened beverage intake and the risk of breast and prostate cancers, as well as a possible link to colorectal and pancreatic cancers. In addition, higher intake of sugar-sweetened beverages increased the risk of pancreatic cancer.[12]

With the increase in research in the field, it was decided to conduct a study using a bibliometric methodology. We can review and measure the volume of scientific production through text analysis to gain information about the topics of study, researchers, and institutions. It can also serve to evaluate scientific activities, inform policy development, develop collaborations, and anticipate future trends with growing interest in journal production and evaluation.[13,14]

The objective was to perform a scientometric mapping of the impact of sugar on cancer growth by analyzing its dynamism, visualization, and emerging patterns.

Materials and Methods

This bibliometric analysis was conducted in accordance with the principles and recommendations outlined in the Reporting and Measurement of Items for Bibliometric or Scientometric Studies in Health Sciences.[15]

Study Design

This investigation was an observational study that adhered to a scientometric approach for assessing the types and quantity of scientific output related to the potential influence of sugars on the progression of cancer, obtained from published literature from January 2019 to January 2025 time frame.

Selection Criteria

For this article, all papers indexed in Scopus that included any terms related to sugar and cancer growth in either the title or abstract published from January 2019 to January 2025 were included. Papers that did not meet the specified search criteria or were not found in Scopus were eliminated from the screening stage. We also excluded duplicate papers, opinion pieces, editorials, conference abstracts, and papers published in any languages other than English. Finally, studies that did not provide complete information or were not directly related to the topic were excluded.

Search Strategy

The search was conducted on January 9, 2025, in the Scopus database. The following search formula was used: TITLE-ABS (“sugar” OR “refined sugar” OR “high fructose corn syrup” OR “fructose” OR “sucrose” OR “dextrose” OR “saccharose” OR “sweetener”) AND TITLE-ABS (“cancer growth” OR “tumor progression” OR “oncogenesis” OR “carcinogenesis” OR “neoplastic growth” OR “malignant growth” OR “tumor development” OR “cancerous growth” OR “tumor expansion” OR “cancer proliferation”) AND PUBYEAR $>$ 2018 AND PUBYEAR $<$ 2026.

Procedure

We used the Scopus, Scival, and Bibliometrix tools to engage in selection, extraction, and analysis protocols. First, we scanned Scopus using the prescribed formula to search for relevant documents. Then, we exported the data to Scival and Bibliometrix to conduct more detailed scientometric analysis. Authors and institutions were evaluated based on their collaboration and productivity in Scival. Authorship and substantive authorship were then analyzed in Bibliometrix for exploratory purposes to assess themes and research trends. Finally, VOSviewer was used to visualize the keyword co-occurrence networks and the collaborations between countries, providing a robust account of the body of research investigating the role of sugar in the growth of cancer.

Statistical Analysis

The statistical analysis focused on several key metrics, including scholarly output, h-index, views per publication, and citation counts across authors, institutions, and countries. International collaborations were assessed using a cross-country collaboration map, highlighting the most frequent connections. In addition, keyword co-occurrence was analyzed to identify the most relevant terms and their interrelationships in cancer research. These metrics provided a comprehensive view of the productivity and impact of researchers and institutions, as well as thematic trends and collaborations in the oncology field. SciVal, R Studio, and VOSviewer tools were used for the analysis.

Results

Between 2019 and 2025, 283 documents from 214 sources were examined. The overall rate of increase was −29.65%, the average age of documents was 3.28 years, and the average citations per document was 16.95. A total of 19,172 references and 895 authors’ keywords were recorded. There was a total of 1857 authors, of whom 6 authored single-authored papers. Average coauthorship per paper was 7.73, and average international coauthorships were 24.38%. A breakdown of publications consisted of 191

articles, 14 book chapters, 2 conference papers, 1 erratum, 2 notes, 1 retracted paper, and 71 reviews [Table 1].

Among the leading authors for the years 2019 to 2025 was Lewis C. Cantley of Cornell University in the United States, who obtained an *h*-index of 173, received 27 views per publication, and had 74 citations. Clemente Capasso of the National Research Council of Italy had an *h*-index of 57, 11 views per publication, and 26 citations. Yangzom Doma Bhutia at the Texas Tech University Health Sciences Center in the United States had an *h*-index of 29, 10 views per publication, and 19 citations. Aneli De Melo Barbosa-Dekker of Universidade Tecnológica Federal do Paraná in Brazil obtained an *h*-index of 33, 13 views per publication, and 22 citations. Catalina A. Asencio-Barría of Pontificia Universidad Católica de Chile had an *h*-index of 29, obtained 19 views per publication, and had 30 citations [Table 2].

Throughout 2019 to 2025, Harvard University (United States) was the most productive institution, with an impressive 85.2 citations per publication and a total of 426 citations. Zhejiang University (China) was the second most productive institution, with 48 citations per publication and a total of 384 citations. Fudan University (China) was incredibly productive during the 2019 to 2025 period, with 31.3 citations per publication and a total of 219 citations. Sun Yat-Sen University (China) also performed strongly, with 21.2 citations per publication and a total of 212 citations. Finally, National Yang Ming Chiao Tung University (Taiwan) achieved 25.4 citations per publication and a total of 127 citations [Table 3].

Table 1: Main Information.

Description	Results
Timespan	2019:2025
Sources	214
Documents	283
Annual growth rate %	–29.6
Document average age	3.28
Average citations per doc	16.9
References	19172
Author's keywords	895
Authors	1857
Authors of single-authored docs	6
Single-authored docs	6
Co-authors per doc	7.73
International coauthorships %	24.38
Article	191
Book chapter	14
Conference paper	2
Erratum	1
Note	2
Retracted	1
Review	71

Table 2: Top 10 Most Productive Authors.

Author	Affiliation	Country	Scholarly Output	*h*-Index	Views Per Publication	Citation Count
Alegranci, Pâmela	Universidade Federal de Mato Grosso	Brazil	2	7	13	22
Asencio-Barría, Catalina A.	Pontificia Universidad Católica de Chile	Chile	2	2	19	30
Awati, Suhas Suresh	Suresh Gyan Vihar University	India	2	3	4.5	9
Barbosa-Dekker, Aneli De Melo	Universidade Tecnológica Federal do Paraná	Brazil	2	33	13	22
Bhutia, Yangzom Doma	Texas Tech University Health Sciences Center	United States	2	29	10	19
Cantley, Lewis C.	Cornell University	United States	2	173	27	74
Capasso, Clemente	National Research Council of Italy	Italy	2	57	11	26
Carreño, Daniela V.	Pontificia Universidad Católica de Chile	Chile	2	6	19	30
Cerda-Infante, Javier F.	Environ Innovation Laboratory	Chile	2	5	19	30
Chang, Chewei	National Cheng Kung University	Taiwan	2	1	8.5	4

Table 3: Top 10 Most Productive Institutions.

Institution	Sector	Country	Scholarly Output	Citations per Publication	Views per Publication	Citation Count
Shanghai Jiao Tong University	Academic	China	11	10.5	11.9	115
Sun Yat-Sen University	Academic	China	10	21.2	23.3	212
Southern Medical University	Academic	China	9	8	18	72
Zhejiang University	Academic	China	8	48	26	384
Fudan University	Academic	China	7	31.3	30.7	219
Nanjing Medical University	Academic	China	6	15.5	11.8	93
Chinese Academy of Sciences	Government	China	5	14.6	16	73
Harvard University	Academic	United States	5	85.2	44.8	426
Memorial Sloan-Kettering Cancer Center	Medical	United States	5	18.8	18.4	94
National Yang Ming Chiao Tung University	Academic	Taiwan	5	25.4	21	127

Table 4: Top 10 Most Productive Sources.

Scopus Source	Scholarly Output	Citations per Publication	SNIP 2023	CiteScore 2023
International Journal of Molecular Sciences	9	31	1.12	8.1
Frontiers in Oncology	8	22.1	0.83	6.2
Nutrition and Cancer	5	8.4	0.64	5.8
Scientific Reports	5	9.2	1.18	7.5
Oncogene	4	45.8	1.37	15.3
Seminars in Cancer Biology	4	42.2	2.18	26.8
Cancer Research	3	28	1.51	16.1
Cancers	3	35.3	1.03	8
Cell Death and Disease	3	16.3	1.45	15.1
Cell Metabolism	3	102	4.43	48.6

The journal *Cell Metabolism* had the highest performance metrics, with 102 citations per publication, an source normalizad impact per paper (SNIP) of 4.43, and a CiteScore of 48.6. *Oncogene* had 45.8 citations per publication, an SNIP of 1.37, and a CiteScore of 15.3. *Seminars in Cancer Biology* had 42.2 citations per publication, an SNIP of 2.18, and a CiteScore of 26.8. *Cancers* had 35.3 citations per publication, an SNIP of 1.03, and a CiteScore of 8. *International Journal of Molecular Sciences* had 31 citations per publication, an SNIP of 1.12, and a CiteScore of 8.1 [Table 4].

There was a notable thematic evolution in cancer research over the years. The "cancer" term reappeared in multiple periods, which indicates an ongoing theme. The shift from "cancer" to "fructose" and "metabolism" suggests a movement toward correlating diet and cancer. The study of "breast cancer" evolved into "hepatocellular carcinoma," followed by other cancers, such as "gastric cancer," demonstrating growing interest in different types of cancer. Terms like "immunotherapy" and "prognosis" were also established as themes due to their repeated appearances and relevance to professional oncology research [Figure 1].

Cluster factor analysis identified several key cancer and cancer research terms. The most noticeable cluster was composed of terms such as "cancer," "fructose," "metabolism," "apoptosis," and "carcinogenesis." This reflects a concentration on biological and molecular processes of cancer, as well as organized studies and animal research. In addition, a high number of terms concerning gene expression and the regulation of gene expression in neoplasms was noted, showing the significance of genetic mapping in the study of cancer research [Figure 2].

The global collaboration map revealed a robust partnership between China and the United States, highlighted by eight joint publications—the highest recorded. The United States also engaged in four collaborative studies each with Canada, India, Korea, and Great Britain. Meanwhile, China partnered most frequently with Hong Kong and Korea (three collaborations each), and with Great Britain (four collaborations). Other noteworthy pairings included Germany and Czechia, as well as France and Canada, both with two shared studies. These patterns underscore the extensive international engagement driving cancer research efforts [Figure 3].

The keyword co-occurrence analysis demonstrates that the largest clusters involved the terms "metabolism," "Mouse," "Genetics," and "carcinogenesis," which reflects a strong relationship between these topics in the study of cancer research. The term "Metabolism" co-occurred most

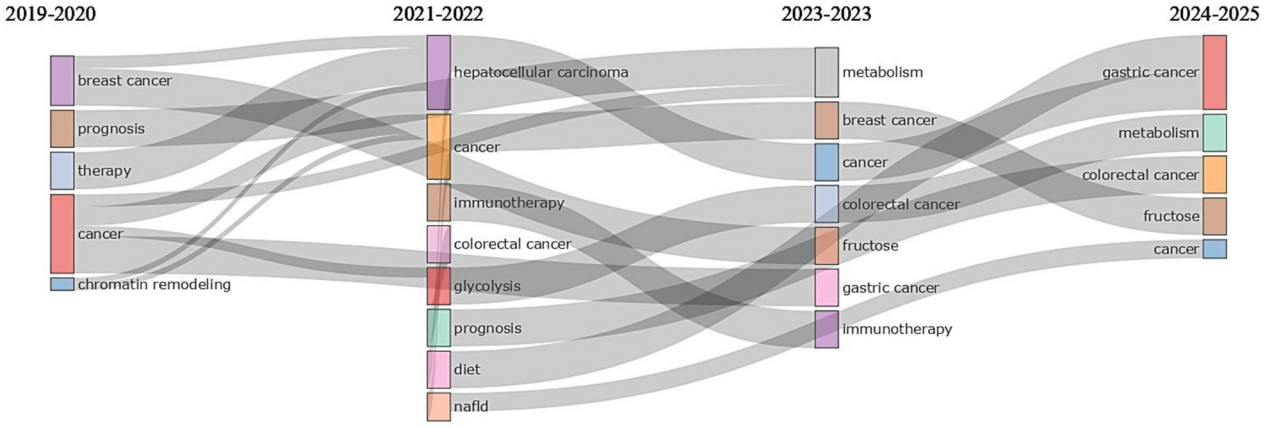

Figure 1: Thematic evolution.

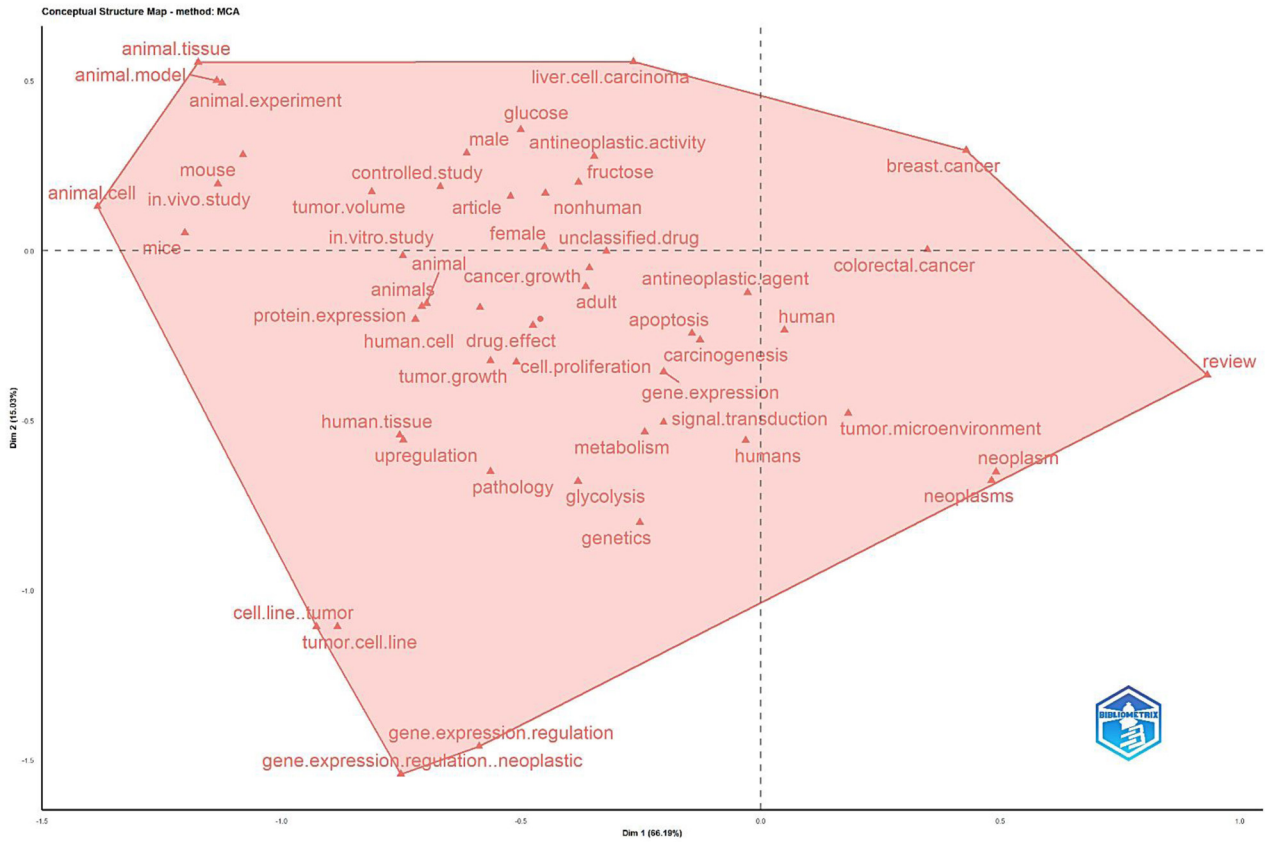

Figure 2: Factorial analysis words by cluster.

frequently in studies that focused on cell proliferation and the regulation of gene expression as primary outcomes, while the terms "Mouse" and "Genetics" co-occurred more often in studies involving *in vivo* experiments and animal model studies. In contrast, "Carcinogenesis," as expected, was referenced often in studies examining the molecular basis of cancer and tumor progression. Overall, these results emphasize the relevance of these topics in understanding cancer-related topics in research, treatment methods, and clinical relevance [Figure 4].

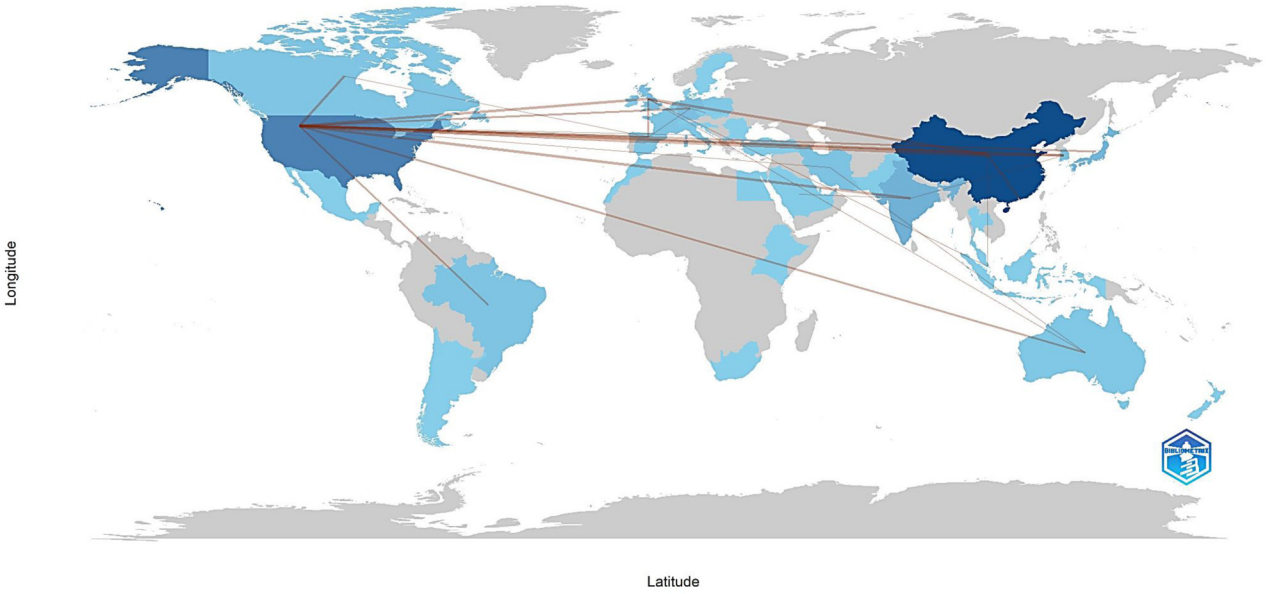

Figure 3: Country collaboration map.

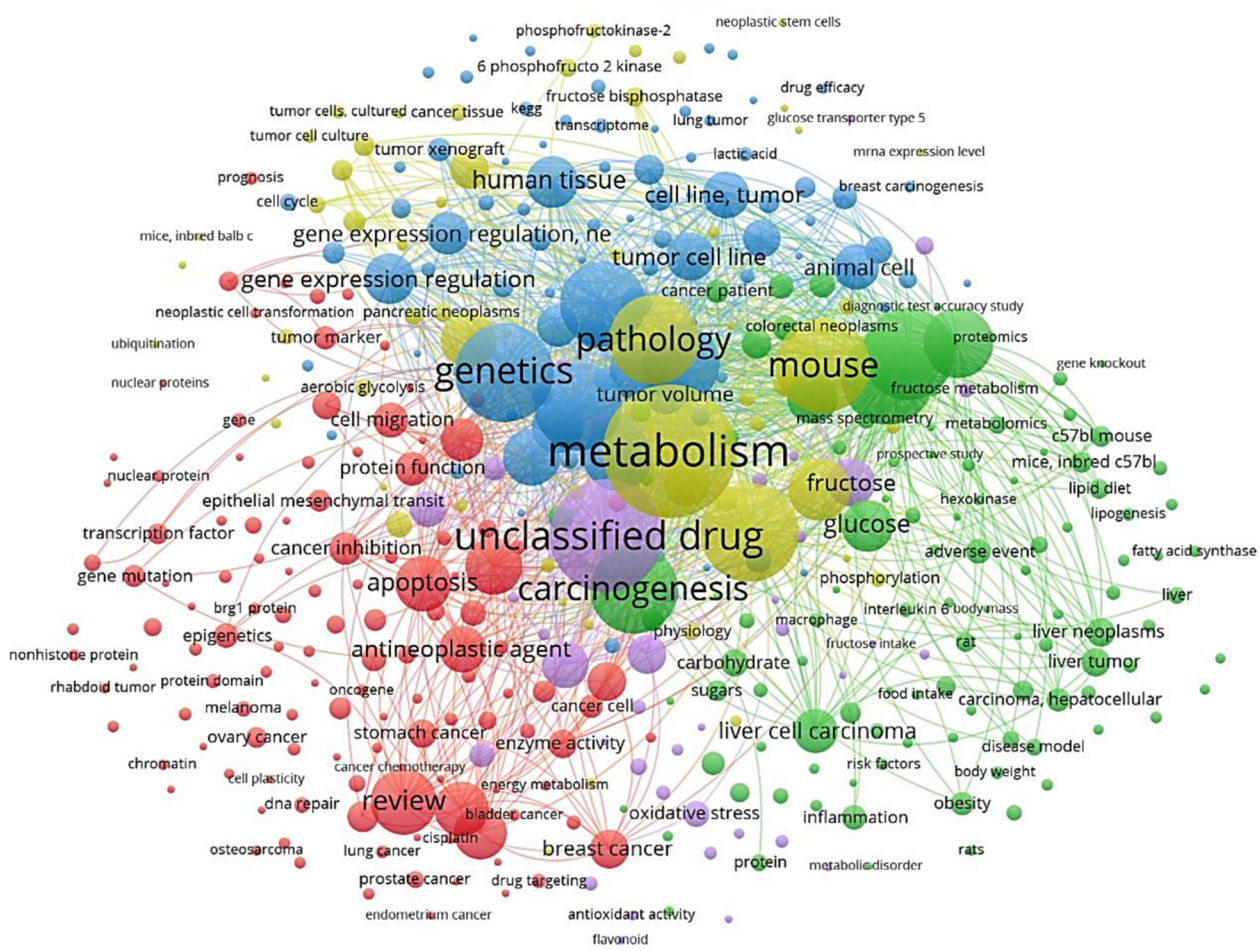

Figure 4: Co-occurrence by index keyword.

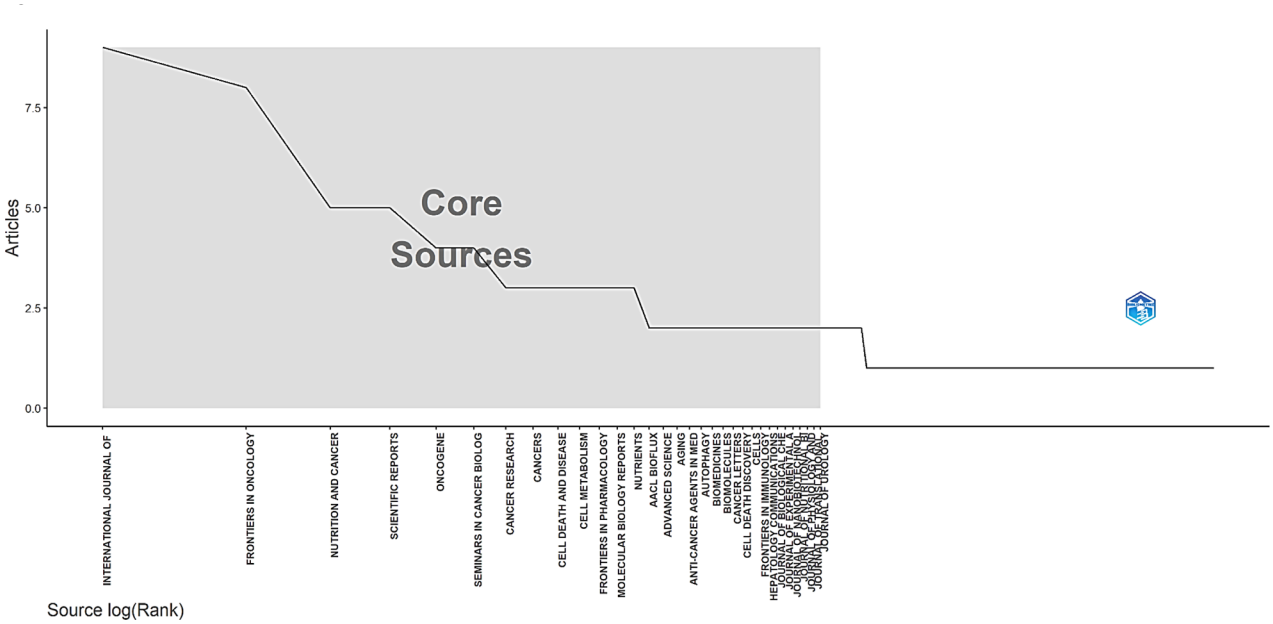

Figure 5: Core source by Bradford's law.

Based on Bradford's law of scattering, during the years 2019 to 2025, the most prolific journals in cancer research can be classified into three zones. In zone 1, the *International Journal of Molecular Sciences* had nine publications, *Frontiers in Oncology* had eight publications, and *Nutrition and Cancer* had five publications. In zone 2, both *Laboratory Investigation and Metabolites* had two publications each. Zone 3 consisted of the journals, *Glycobiology*, *Heliyon*, and *Nature Cell Biology*, where each journal had one publication. As indicated in this analysis, although a number of journals are included, most of the publications are found in a handful of journals [Figure 5]

Discussion

The consumption of added sugars has been associated with an increased risk of various diseases such as obesity, cardiovascular disease, and diabetes. Their consumption has also been linked to cognitive decline and certain types of cancer.[16] Furthermore, excessive intake of these sugars promotes chronic inflammation and oxidative stress, which are processes involved in the development of cancer.[10] Furthermore, refined carbohydrates increase the creation of reactive oxygen species and generate DNA damage, which favors the spread of cancer cells and the development of tumors.[17]

As an example, Lu *et al*. conducted a bibliometric analysis on low-carbohydrate diets, reporting 6938 published documents between 2002 and 2021, including 5350 articles and 1588 reviews. The scientific output continued to increase over the years, and the increase in published papers reflected a growing interest in low-carbohydrate diets within the scientific (academic) community.[18] In a different trajectory, we conducted an analysis between the years 2019 and 2025 and produced 283 published documents from 214 publishing outlets. The growth rate was −29.65% per year, but an average of 16.95 citations per published document indicated the impact of these documents on the scientific community. There was an average of 7.73 authors per published document and an international coauthorship rate of 24.38%, showing the relationship between researchers from different countries. Also, there were 191 articles, 14 book chapters, 2 conference proceedings, 1 erratum, 2 notes, 1 retracted publication, and 71 reviews.Based on this scientometric analysis, Harvard University in the USA ranked first, with an average of 85.2 citations per publication and a total of 426 citations, making it the top institution researching the effect of sugar on the cancer growth. Li *et al*., similarly noted that Harvard University was the top-ranking institution in low-carbohydrate diet studies, with a total of 451 published works. Its massive contribution to this field of science was acknowledged because it produced high-impact articles and studies that have accelerated the development of this area of research.[18]

Our analysis showed robust collaboration between China and the United States, with a total of eight collaborative efforts. The United States, additionally, formed research partnerships with Canada, India, Korea, and the UK, amounting to four collaborations. China, on the other hand, had frequent collaboration with Hong Kong and Korea (three collaborations each), and the UK (four collaborations). The collaborations between Germany and Czech Republic, and between France and Canada, each with two collaborations, are also noteworthy. In terms of the outcomes from Youn *et al*.'s study, it was stated that authors from Italy have actively engaged with authors from Germany, the UK, France, and Spain. Similarly, the second author group that participated in the most collaborations was the UK authors, who partnered with authors from Germany, France, and Spain.[19]

It is important to recognize some of the limitations of our scientometric analysis, the most significant being that the only data source utilized was Scopus, which excluded studies published in other data sources (e.g., PubMed, Web of Science) and limited the scope of the analysis and excluded studies. In addition, the evaluation period was only the last 5 years, thus limiting our ability to assess long-term trends in research. Regardless of these limitations, our study makes valuable contributions to future research, as it allows for the examination of patterns in scientific production and collaboration networks among researchers and countries, contributing to a more thorough understanding of research advances in this area.

Conclusion

In the timeframe being evaluated, trends in international collaboration and thematic evolution made noteworthy contributions to this field. The most prominent academic institutions and authors identified in the study—including Harvard University and Lewis C. Cantley—have generated a significant portion of the knowledge in this area, although this can and should greatly expand as the subject area grows. Numerous major, reputable journals, including *Cell Metabolism* and *Oncogene*, have published key research in the area. This study is important for recognizing trends and priorities in cancer research, which can direct future research and inform public health strategies, while also taking a step further by providing future prevention and clinical application by direct applicability of their findings in funded cancer research. Reasonably, this application could lead to optimal use of timing, economic resources, and opportunities for pursuit of critical, anticipated areas of oncology and cancer prevention and treatment.

Financial support and sponsorship

Nil.

Conflict of interest

The authors affirm that they have no conflicts of interest to declare.

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