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# Global Knowledge Dynamics in Liver Cancer Nutrition: A Bibliometric Analysis with Implications for Health Education and Policy

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## Abstract

Liver cancer remains a major global health challenge and is currently one of the leading causes of cancer-related mortality worldwide. Nutrition plays a critical role across the continuum of liver cancer prevention, disease progression, treatment tolerance, and survival outcomes. Despite the growing number of studies in this area, the overall knowledge structure, research hotspots, and developmental trajectory of nutrition-related liver cancer research have not been systematically mapped. This study therefore conducted a bibliometric analysis to evaluate global research trends, collaborative patterns, and emerging themes in the field, while also considering implications for health education and policy. On 21 November 2025, publications related to nutrition and liver cancer were retrieved from the Scopus database using a structured search strategy. Only articles were included. After duplicate removal and manual screening based on titles and abstracts, 539 articles were retained for final analysis. Bibliometric mapping and visualization were performed using VOSviewer (version 1.6.20) and CiteSpace (version 6.4.R1). The analysis examined annual publication output, countries and institutions, keyword co-occurrence, clustering patterns, and citation burst trends. The results showed that 2,873 authors from 1,089 institutions across 88 countries and regions contributed to this field. China, the United States, and Japan were the most productive countries. Publication output remained limited before 2010 but increased markedly thereafter, indicating a rapid expansion of scholarly interest in the nutritional dimensions of liver cancer. Keyword analysis revealed that major research

themes include prognosis, liver cirrhosis, risk factors, nutritional assessment, and nutritional status. Burst detection further showed a clear evolution in research emphasis, moving from early topics such as parenteral nutrition and liver function toward more recent interests in imaging technologies, inflammatory and immune-related indicators, prognostic nutritional index, and survival outcomes. Overall, this study provides a comprehensive overview of the global knowledge dynamics in liver cancer nutrition research. The findings may support future interdisciplinary research, improve the translation of nutritional evidence into clinical and public health practice, and inform health education strategies and policy development aimed at reducing disparities in liver cancer outcomes.

**Keywords:** Liver Cancer; Nutrition, Bibliometric analysis, Health Education, Global health disparities

## 1. Introduction

Liver cancer is one of the most common tumors worldwide. 2022 global cancer statistics indicated that it ranks 6th in terms of incidence rate and 3rd in terms of mortality rate among all cancers[1]. In recent years, although the age-standardized incidence rate of liver cancer has decreased in some countries, the total number of global liver cancer cases is still on the rise[2]. It is expected that the disease burden caused by this illness will continue to increase in the coming decades. Asia is the main high-incidence region for liver cancer globally, with more than 70% of the world's new cases concentrated here. China has long been shouldering the heaviest disease burden of liver cancer in the world[3]. Compared with other malignant tumors, the incidence of liver cancer shows significant geographical differences and is closely related to a variety of chronic liver diseases. These include traditional risk factors such as long-term alcohol consumption, hepatitis C virus (HCV) infection, aflatoxin exposure, and, of course, hepatitis B virus (HBV) infection.

However, with the rapid spread of metabolic syndrome, obesity, type 2 diabetes, and metabolic-associated steatotic liver disease (MASLD), the role of metabolism-related factors in the occurrence and development of liver cancer has become increasingly prominent[4]. This is also driving changes in the epidemiological structure of liver cancer, and the focus of its prevention and control has been adjusted accordingly.

Nutritional factors play an important role in the occurrence, development, and treatment of liver cancer. A large body of evidence from epidemiological and basic research indicates that dietary structure, intake of key nutrients, and overall nutritional status can all affect the liver's metabolic environment, inflammatory levels, and the risk of hepatocellular carcinogenesis[5,6].A healthy diet may lower your risk of liver cancer (hepatocellular carcinoma). The Mediterranean and Plant-based diets appear to benefit cardiovascular health. On the other hand, a diet that

consists of high red/processed meat, sugar, and saturated fat may lead to accumulation of fat in the liver, oxidative stress, and chronic inflammation, which may increase liver cancer risk[7,8]. In addition, the recovery level of liver cancer patients is also influenced by their nutritional status. At the time of diagnosis, many liver cancer patients have complications like liver cirrhosis, malnutrition or sarcopenia (loss of muscle mass). Malnutrition can make it harder for the patient to tolerate surgery, transarterial or systemic therapy, but more importantly, is associated with poorer survival and more complications[9–11]. In the past few years, some studies have pointed out that implementing standardized nutritional assessment and evidence-based nutritional interventions for patients with liver cancer during their management helps in the improvement of patients' quality of life, treatment response, and disease prognosis[12–15].

The research surrounding the importance of nutrition for liver cancer prevention and control has developed over the past years. However, differences remain between existing studies. These differences include research design, population differences, methods of measuring nutritional exposure, and exploration of mechanism. In addition, the growth of studies in this area has increased rapidly in recent years, and research hotspots are constantly evolving. These studies cover multi-dimensional topics including dietary patterns, metabolic nutrition, gut microbiome, and nutritional assessment and intervention, making it of great significance to systematically sort out the trajectory of their development. Therefore, conducting an overall analysis of the development trend of nutrition-related liver cancer research using bibliometric methods can help identify important research topics, core authors and institutions, key high-impact literatures, and potential gaps in future research in this field. This not only facilitates the construction of a knowledge map for nutrition and liver cancer research, but also provides more directional evidence support for subsequent basic research, clinical practice, and public health strategies. Beyond clinical implications, research on nutrition and liver cancer also has important social and educational dimensions. Nutritional awareness, public health education, and socio-economic factors significantly influence dietary behavior and disease outcomes. Understanding how scientific knowledge in this field evolves and is disseminated can support the development of effective health education programs, inform policy decisions, and reduce global health disparities. This study is also informed by the framework of social determinants of health, which emphasizes how socio-economic conditions, education, and access to healthcare shape health outcomes. In addition, concepts from health communication and health literacy are relevant in understanding how scientific knowledge is disseminated and translated into patient care and public awareness. Based on this, this study aims to systematically evaluate the overall trends, knowledge structure, and research hotspots of nutrition and liver cancer research in recent years through quantitative bibliometric approaches, in order to provide references for the research directions of related fields in the future.

Data and Methods

## Literature Retrieval Sources and Strategies

Articles on nutrition in liver cancer were obtained from the Scopus database. The period covered was from the database's establishment to 2025, and the final search was performed on 21 November 2025.The literature search technique was as follows: (TITLE - ABS - KEY (liver cancer OR liver neoplasms OR hepatocellular carcinoma) AND TITLE - ABS - KEY (nutrition)), with the item type limited to "Article". The range of dates was "all years." A total of 804 publications on nutrition and liver cancer were identified. Then, duplicate literature was excluded using the reference management software Zotero, and literature irrelevant to the research topic was manually removed by reading their titles and abstracts, leaving 539 pieces of literature. Figure 1 shows the publication screening procedure flowchart.

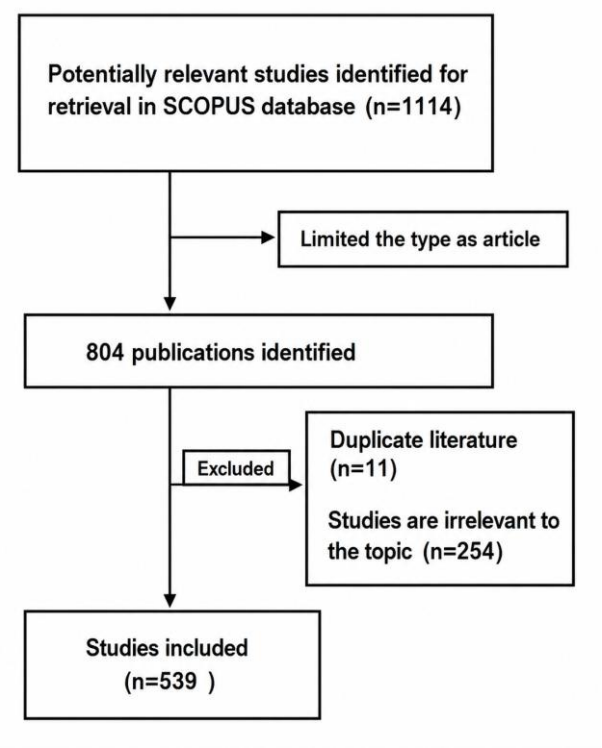


**Figure 1. Flowchart for screening literature**

## Methods

We searched the Scopus database and downloaded the bibliometric data, then imported the data into CiteSpace and VOSviewer for further analysis and network

creation. The following data were extracted: keywords, volume of publications, organization, and publication country/region of this study.

## Visualized and Bibliometric Analysis (VOSviewer and Citespace)

In this study, VOSviewer and CiteSpace were employed to visualize the retrieved literature and construct knowledge graphs. VOSviewer is a data visualization software based on bibliometric networks, specializing in processing large-scale literature data. By constructing co-occurrence, co-citation, and collaboration networks among literatures, authors, keywords, or institutions, it generates multiple forms of visualization results, such as node distribution density maps, cluster graphs, and network diagrams. Its advantages lie in an intuitive interface, clear color differentiation, and stable clustering algorithms, which enable it to identify hot topics in research fields, author collaboration relationships, and groups of highly influential literatures.

CiteSpace is a visualization software designed for analyzing the knowledge structure of scientific literature, with an emphasis on identifying key nodes, knowledge evolution paths, and emerging research frontiers in research fields. Its core functions include burst detection, time-zone mapping, cluster view, and co-citation network analysis. These functions allow it to reveal the evolutionary trends of research topics over time and structural changes within the field.

In this study, VOSviewer was mainly used to construct keyword co-occurrence networks, so as to identify the main thematic structure of research on nutrition and liver cancer. CiteSpace, on the other hand, was applied to conduct keyword clustering and burst analysis, time-zone visualization, and analysis of changes in countries and research institutions, in order to reveal the temporal evolution patterns of research hotspots in this field. The combined use of these two tools helps to construct a more comprehensive and systematic knowledge graph, enhancing the interpretability and reliability of bibliometric results.

## Results

*Analysis of annual publications*

A total of 539 research papers related to liver cancer nutrition were retrieved from the Scopus database. As shown in Figure 2 (Appendix A), academic research on liver cancer nutrition began in 1967, but it was not until 2010 that a relatively significant increase emerged. Since 2011, the number of papers has grown steadily year by year, and the number of papers to be published in 2026 is expected to continue increasing.

Between 1967 and 2009, only 110 papers were published, with an average of 2.56 papers per year. During this period, research on liver cancer nutrition was still in its early stage and had not received widespread attention. However, the number of papers published between 2010 and 2025 (recorded as 16 years as of November 2025) surged significantly, reaching 429, with an average of 26.8 papers per year

Figure 2）. This indicates that researchers are paying increasing attention to the importance of nutrition in the occurrence, development, prevention, and treatment of liver cancer, regarding it as a key research field.

Analysis of countries/regions and institutions

The national cooperation network is mapped and analyzed with "country" as the node (Figure 3, Appendix A). According to the dataset, current research on liver cancer nutrition has been published in multiple regions around the world. As shown in the data of Table 1, China, the United States, and Japan rank among the top three in terms of the number of published papers, each with more than 100 papers. This fully demonstrates the activity of these three countries in the field of liver cancer nutrition research. Although Italy (60 papers) and Germany (51 papers) have a large gap in the number of published papers compared with the top three, their international cooperation degree is significantly higher.

This map shows the research cooperation network between countries/regions on the topic.Nodes = countries. Larger nodes mean more published papers. Connecting lines = cooperation between countries. Thicker lines mean stronger cooperation. Purple circles around nodes = betweenness centrality. More obvious circles mean the country plays a more important "bridge" role in the global network.

| Rank | Country/region | Publications | Cooperation Degree | Centrality |
|---|---|---|---|---|
| 1 | CHINA | 139 | 2 | 0.04 |
| 2 | UNITED STATES | 128 | 1 | 0 |
| 3 | JAPAN | 104 | 5 | 0 |
| 4 | ITALY | 60 | 11 | 0.05 |
| 5 | GERMANY | 51 | 10 | 0.06 |
| 6 | UNITED KINGDOM | 50 | 9 | 0.03 |
| 7 | FRANCE | 49 | 6 | 0.04 |
| 8 | SPAIN | 37 | 7 | 0 |
| 9 | SWEDEN | 35 | 11 | 0.08 |
| 10 | NETHERLANDS | 34 | 9 | 0.08 |

**Table 1. Top 10 most prolific countries in the field of liver cancer nutrition.**

The institutional cooperation network is mapped and analyzed with "institution" as the node (Figure 4, Appendix A). Based on a comprehensive analysis of the number of published papers, cooperation degree, and centrality indicators, the top three institutions are all research centers, namely the Centre international de Recherche sur le Cancer (30 papers), the German Cancer Research Center (30 papers), and the Centro de Investigación Biomédica en Red de Epidemiología y Salud Pública (29

papers). They are the three core institutions in the field of liver cancer nutrition research, jointly forming a complex research cooperation network, and their international cooperation degree is significantly higher than that of other institutions. Although the number of papers is small, Emory University (7 papers) has a relatively high centrality score, which indicates that it has a unique position in the field of liver cancer nutrition research.Table 2 shows the top 10 highly productive organizations in the field of liver cancer nutrition.

This diagram shows the cooperation network of research institutions in the relevant literature. Each node stands for an institution, with its size proportional to the number of papers published. Colors range from cool to warm for different publication periods, and red denotes institutions active in recent research. Lines between nodes indicate cooperation—denser lines mean closer collaboration.

| Rank | Institution | Publications | Cooperation Degree | Centrality |
|---|---|---|---|---|
| 1 | Centre international de Recherche sur le Cancer | 30 | 81 | 0.02 |
| 2 | German Cancer Research Center | 30 | 65 | 0.01 |
| 3 | Centro de Investigación Biomédica en Red de Epidemiología y Salud Pública | 29 | 78 | 0.01 |
| 4 | Imperial College London | 29 | 49 | 0 |
| 5 | UiT Norges Arktiske Universitet | 29 | 43 | 0.01 |
| 6 | School of Medicine | 29 | 37 | 0 |
| 7 | German Institute of Human Nutrition | 28 | 55 | 0 |
| 8 | Fondazione IRCCS Istituto Nazionale dei Tumori | 25 | 67 | 0.01 |
| 9 | Instituto de Salud Publica | 25 | 48 | 0 |
| 10 | Rijksinstituut voor Volksgezondheid en Milieu | 25 | 44 | 0 |

**Table 2** Top 10 highly productive organizations in the field of liver cancer nutrition.

**Analysis of Keywords Co-Occurrence**

Keywords reflect the core content and core viewpoints of an article. Through keyword analysis, we can provide a typical overview of research trends. We collected keywords that appeared more than 20 times in the Scopus Core Database from the authors of the literature and included them in the final analysis.

A total of 189 keywords were involved in this analysis. After excluding the main keywords "liver cancer" and "nutrition", as well as the category-limiting keywords

"article" and "human", the most frequently occurring keywords were "male" and "female" — with occurrence frequencies of 365 and 345 times respectively, and total link strengths of 9389 and 9037 respectively. These two keywords have strong associations with terms such as "prognosis", "liver cirrhosis", "risk factor", "nutritional assessment", "nutritional status", and "pathology". Additionally, the total occurrence frequency of each of the aforementioned associated keywords exceeds 100 times ( Figure 5, Appendix A).

Size of nodes indicates the frequency of occurrence. The shorter the distance between two nodes, the larger the number of co-occurrences of the two keywords. also created a keyword density distribution map to display the occurrence frequency of high-frequency words. The results show that "human" is the most common, followed by "article", "male", and "female" (Figure 6, Appendix A).

189 keywords that occurred more than 20 times were enrolled. The font size represents the frequency of occurrence.

Table 3 only lists the top 30 most frequently occurring keywords, among which the top five keywords related to the research theme are "prognosis", "liver cirrhosis", "risk factor", "nutritional assessment", and "nutritional status" in sequence. The above-mentioned high-frequency keywords indicate that in the field of liver cancer nutrition research, nutritional assessment, risk prevention and control, and the relationship between nutrition and liver cancer prognosis are the core research directions.

| Rank | keyword | occurrences | total link strength |
|---|---|---|---|
| 1 | human | 534 | 11582 |
| 2 | article | 440 | 10249 |
| 3 | humans | 399 | 9533 |
| 4 | liver cell carcinoma | 393 | 9032 |
| 5 | male | 365 | 9389 |
| 6 | female | 345 | 9037 |
| 7 | liver neoplasms | 306 | 7285 |
| 8 | adult | 298 | 7966 |
| 9 | carcinoma, hepatocellular | 274 | 6673 |
| 10 | aged | 262 | 7140 |
| 11 | middle aged | 240 | 6813 |
| 12 | major clinical study | 239 | 6787 |
| 13 | liver tumor | 202 | 5103 |
| 14 | controlled study | 191 | 5007 |
| 15 | hepatocellular carcinoma | 168 | 4256 |
| 16 | priority journal | 151 | 3334 |
| 17 | prognosis | 145 | 4260 |

| | | | |
|---|---|---|---|
| 18 | retrospective study | 138 | 4114 |
| 19 | nutrition | 137 | 2766 |
| 20 | liver cirrhosis | 136 | 3086 |
| 21 | risk factor | 123 | 3542 |
| 22 | nutritional assessment | 114 | 3420 |
| 23 | nutritional status | 114 | 3116 |
| 24 | pathology | 109 | 3048 |
| 25 | retrospective studies | 106 | 3227 |
| 26 | follow up | 101 | 3249 |
| 27 | overall survival | 100 | 3433 |
| 28 | nutrition assessment | 99 | 3054 |
| 29 | risk factors | 94 | 2639 |
| 30 | cohort analysis | 93 | 3028 |

**Table 3** Top 30 keywords in terms of frequency and link strength in the field of liver cancer nutrition.

Keyword burst analysis can help researchers intuitively grasp the hot topics, core concepts, and research trends in related fields during different time periods. By observing the burst duration and intensity of keywords, the degree of impact caused by their burst can be evaluated: the longer the burst duration and the higher the intensity, the more significant the influence of the topic in the related field. analyzed the keywords using time-series burst detection technology and selected the 25 keywords with the highest burst intensity (Figure 7, Appendix A). Early bursts (1980–2000) were dominated by clinical descriptors and basic hepatic functions, including “middle age,” “case report,” “parenteral nutrition,” and “liver function.” During the mid-2000s to 2016, the research focus shifted toward epidemiological and risk-related topics. Keywords such as “hepatitis C,” “controlled study,” “risk factors,” and “cancer risk” showed strong citation bursts. From 2018 onward, newer bursts predominantly concentrated on diagnostic technologies, inflammatory markers, nutritional status indicators, and survival outcomes. High-intensity recent keywords included “adverse event,” “computer-assisted tomography,” “neutrophil-lymphocyte ratio,” “prognostic nutritional index,” “overall survival,” and “progression-free survival.”Notably, “lymphocyte count” remained a strong burst keyword through 2025.

This figure displays the 25 keywords with the highest burst strength from the research literature related to the research topic between 1967 and 2025. The left side lists each keyword's year of occurrence, burst strength, as well as the start and end times of the burst; the red bars on the right represent the periods of high-frequency bursts of the keywords within this time frame, while the blue-green horizontal lines indicate the overall time span during which the keywords appeared.

Keyword cluster analysis can help us to identify the major research themes and conceptual structures within the field. Based on modularity and similarity measures, we used CiteSpace to construct a co-occurrence network of keywords and generate clusters. The resulting clusters represent groups of keywords that frequently appear together across the literature, indicating closely related research topics. In this study, Keyword clustering reveals that the focus of nutritional research in liver cancer centers on Cluster #0 (Prognostic Nutritional Index, PNI), indicating that nutritional assessment and prognostic prediction represent the most mature research directions in this field. Other key clusters include Cluster #6 (liver cirrhosis), Cluster #4 (blood protein levels), and Cluster #7 (amino acids). The network diagram shows that current research primarily focuses on retrospective evaluations of indicators such as PNI, while studies on the implementation of nutritional interventions still need to be strengthened. (Figure 8, Appendix A).

This figure presents 10 main clustering themes in liver cancer nutrition research through keyword co-occurrence analysis. The size of the nodes in the figure reflects the frequency of keyword occurrences, and the strength of the connecting lines indicates the number of co-occurrences.

## Discussion

*Trends in Annual Publications*

The continuous growth in publications reflects the increasing scholarly recognition of the importance of nutrition in liver cancer prevention, development, and clinical management. While research on the topic picked up from as early as 1967, the output in this field remained extremely limited for more than forty years, with just 110 papers published before 2010. This early phase was marked by a scattering of studies which integrated minimal nutritional science into hepatology. There is a sharp increase in publications post-2010, especially from 2011. This suggests that the role of nutrition is increasingly getting recognition in the multifactorial etiology of liver cancer. Several global trends may explain this surge. Increasingly the research interest in metabolic and nutritional determinants of hepatocarcinogenesis has strengthened due to the large burden of metabolic dysfunction-associated steatotic liver disease, obesity, and diabetes[16–18]. Furthermore, new insights into the roles of clinical nutrition, body composition assessment, and prognostic nutritional indices will generate new insights into the influence of nutritional status on treatment tolerance, survival outcome, and quality of life in liver cancer patients[12,13,19–23]. Consequently, the increasing trend of publications in the field indicates that nutrition is an up-and-coming and essential field on liver cancer research, and it will continue to grow in the future.

*Distribution of Countries/Regions and Institutions*

The investigation into contributory countries found that China, the US and Japan are key players in research output. The major share of the high disease burden in Asia,

particularly China, has impacted their leadership. Liver cancer is a major public health problem in China because of chronic hepatitis B and metabolic risk factors[24,25]. Although Italy and Germany have a lower volume of publications, they demonstrate a higher degree of international collaboration

The most impactful researchers in this area work more frequently with others. The international character of research on nutrition and liver cancer is shown by the fact that the Centre International de Recherche sur le Cancer and the German Cancer Research Center are the most important institutional contributors. Institutions that pair cancer epidemiology expertise with some metabolic research and clinical oncology expertise can yield larger and more integrative output. The high centrality of Emory University, however lower publication volume, suggests that the university is functioning as an important bridge in the network. These organizations can be centers of knowledge that connect different research groups, share data and develop methods. The study's results suggest that liver cancer nutrition research is now a networked field where many high-burden countries and globally influential research institutions are involved. These differences not only reflect variations in research capacity but also indicate disparities in health education systems, public awareness, and policy priorities across countries. Strengthening international collaboration is essential to bridge these gaps and promote equitable dissemination of knowledge, particularly in low and middle-income countries.

*Research Focus Based on Keyword Co-Occurrence and Clustering*

The results of keyword co-occurrence analysis indicated that studies on this subject are mainly focused on nutritional assessment, risk factors, liver cirrhosis-related nutritional issues, and prognostic nutritional factors. The citation of keywords like “nutritional assessment”, “nutritional status”, “risk factor” and “prognosis” shows that academic experts are paying more attention to the effect of nutritional conditions on liver cancer development and outcome. The demographic characteristics of “male” and “female” appears to be strongly associated with nutritional and clinical terminology. This suggests that gender differences may be involved in susceptibility to disease, nutritional risk assessment, or response to therapy.

Further analysis of burst shows the temporal evolution of research hotspots. Citation burst analysis provides a clear representation of the development trajectory of studies in this field. The first keywords were “parenteral nutrition”, “liver function” and “clinical article”. These keywords indicated that the early research was mainly on basic clinical management and hepatic physiology. They were the first pillar focusing on nutritional support, which has remained a primary objective in liver disease management. As the field advanced, mid-term burst keywords including “hepatitis C,” “risk factors,” and “cancer risk” reflect a shift in research focus toward etiological understanding, epidemiological evidence, and population-based risk characterization. The global shift in the epidemiology of liver tumors and the increasing focus on evidence-based clinical decision-making are reflected in these

terms. The emergence of keywords with high burst strength such as “neutrophil-lymphocyte ratio,” “prognostic nutritional index,” and “overall survival” in recent years suggests a significant trend toward more precise prognostic evaluation, with systemic inflammatory and nutritional markers more frequently incorporated into clinical assessments. In the meantime, “computer-assisted tomography” and “adverse event” suggest improved imaging techniques and greater interest in perioperative or treatment-related events. The continued burst activity of “lymphocyte count” until 2025 indicates a sustained interest in immune-nutrition interactions; likely to have wider application with research on cancer metabolism, and surgical outcome. Overall, the trends amount to a shift from clinical characterization toward more complex, multidimensional research involving imaging, immunological biomarkers, and outcome-oriented indices.

The field of hepatology and oncology is likewise moving toward more personalized, biologically driven patient care.

The keyword clustering analysis reveals the most current research themes on nutrition in liver cancer: prognostic assessment. Cluster #0 (the prognostic nutritional index, PNI) is at the centre of the network and that is the backbone of the study along with closely related “retrospective studies” Cluster #4 (blood protein levels), Cluster #6 (liver cirrhosis). This means that previous research on postoperative risk assessment and long-term prognosis in liver cancer patients has centered on the use of readily available biomarkers such as PNI, serum albumin and liver enzymes. Even though this research path has equipped us with efficient clinical screening tools, that focus on risk identification and prognosis evaluation, it is descriptive by nature and does not enable the clinical implementation of proactive measures to improve outcomes. Though the research has primarily focused on assessment, interventions strategies have in also in scope. Researchers are interested in using specific nutrients, like, branched-chain amino acids (BCAAs), in liver cancer complicated by cirrhosis, protein synthesis disorders, and integration with chemotherapy/pharmacotherapy. In this study, BCAAs were investigated in rats and a clinical trial was conducted. Overall, the clusters are more focused on clinical and biochemical parameters (Cluster #4) or supplementation of substances (Cluster #7: amino acids), but nothing to do with Implementation Science. It suggests that the current research focus in this domain is at the 'identifying problems' stage (i.e. determining which patients might be at risk of poor prognosis) and that this has not yet been translated on a large scale into proactive, integrated intervention research that focuses on ‘solving problems’.

*Limitations*

Several limitations apply to this study. The Scopus database was used to gather all data; however, Scopus is by no means all-encompassing of the global population. Publications indexed in other databases, e.g. Web of Science, PubMed, or regional repositories may have different patterns. The second factor concerns the use of

author-provided keywords. Each journal or country may have different oversight regarding the keywords. Subsequently, this would result in an incomplete picture for certain themes. In short, bibliometric study at the macro level describes the pace of research but cannot replace detailed qualitative analysis of study design clinical outcome or mechanism. The use of bibliometric analyses of scientific publications can indeed help the physician to a lesser degree than a systematic review and meta-analysis of randomised trials.

*Social and Educational Implications*

The findings of the bibliometric analysis extend beyond biomedical research and have important implications for social science and education. Nutritional status is strongly influenced by socio-economic conditions, health literacy, cultural dietary practices, and access to healthcare services. Therefore, disparities in liver cancer outcomes across regions may reflect underlying inequalities in education and public health infrastructure. The increasing focus on prognostic nutritional indicators and survival outcomes highlights the need for effective patient education and community-level interventions. Public health programs can play a critical role in promoting healthy dietary behaviors, improving early detection, and enhancing treatment adherence.

Furthermore, the global collaboration patterns identified in this study indicate opportunities for knowledge transfer between high and low-resource settings. Strengthening interdisciplinary collaboration between medical researchers, educators, and policymakers is essential for translating scientific evidence into practical health education strategies and policies.

## Conclusion

This bibliometric analysis provides a detailed overview of global research on the topic of liver cancer nutrition between 1967 and 2025. It shows that there was an increasing and continuous scientific output, particularly after 2010, illustrating that nutrition for the prevention, progression, and management of liver cancer is gaining importance. China, the USA and Japan are the main contributors, while international research facilities helps in collaboration and defining the directions for research. A keyword analysis has shown that the early studies focused on parenteral nutrition whereas the more recent ones have investigated body composition, immunonutrition, prognostic nutritional indices, and survival. These findings highlight the increasing involvement of nutrition in hepatology, oncology, and metabolic research.

In summary, the knowledge structure, evolution, and new frontiers of liver cancer nutrition research were presented. The findings offer useful information to structure interdisciplinary collaboration, foster adequate investment, and facilitate the advancement of evidence-based nutritional approaches for preventing and tackling liver cancer through the identification of influential countries as well as institutions and hotspots for research.

## Declaration

### Ethics approval and consent to participate:

This study is a bibliometric analysis based on published literature and did not involve human participants, animals, or identifiable personal data.

### Consent for publication:

Not applicable.

### Availability of data and materials:

The bibliometric data used in this study were obtained from the Scopus database. The processed data supporting the findings of this study are available from the corresponding author upon reasonable request.

### Competing interests:

The authors declare that they have no competing interests.

### Authors' contributions:

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by the authors. All authors read and approved the final manuscript.

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