Traditional, Complementary and Alternative Medicine Studies in Oncology: A Web of Science-based Bibliometric Network Analysis (2020-2024)

Onkolojide Geleneksel, Tamamlayıcı ve Alternatif Tıp Çalışmaları: Web of Science Tabanlı Bibliyometrik Ağ Analizi (2020-2024)

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ABSTRACT

Objective: Traditional and complementary medicine plays a significant role in the prevention and treatment of diseases by supporting modern medical practices. Particularly in the field of oncology, such practices are effective in enhancing patients' quality of life and supporting treatment processes. This study aims to conduct a bibliometric analysis of the scientific literature on traditional, complementary and alternative medicine in oncology between 2020 and 2024.

Methods: A total of 1,884 publications retrieved from the Web of Science Core Collection database were analyzed. The study examined the most cited publications, distribution by year and language, contributing countries, publishers, research areas, and keyword usage. Co-authorship, author citation, country citation, and bibliographic network visualizations were performed using VOSviewer software.

Results: A notable increase in oncology-related studies focusing on traditional and complementary medicine was observed between 2021 and 2024. The United States of America (USA) and China emerged as the leading countries in terms of both publication output and citation impact. Publishers such as Elsevier and Springer

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Amaç: Geleneksel ve tamamlayıcı tıp, modern tıp uygulamalarına destek olarak hastalıkların önlenmesi ve tedavisinde önemli bir rol üstlenmektedir. Özellikle onkoloji alanında, bu uygulamalar hastaların yaşam kalitesini artırmada ve tedavi süreçlerini desteklemede etkili yaklaşımlardır. Bu çalışmanın amacı, 2020-2024 yılları arasında onkoloji alanında yapılan geleneksel, tamamlayıcı ve alternatif tıp konusu ile ilgili çalışmaların bibliyometrik analizini yapmaktır.

Yöntemler: Web of Science Core Collection veri tabanından elde edilen 1884 çalışma analiz edilmiştir. En çok atıf alan yayınlar, yıllara ve dillere göre dağılım, katkı sağlayan ülkeler, yayınevleri, araştırma alanları ve anahtar kelime kullanımı gibi değişkenler incelenmiştir. Yazar iş birliği, yazar atıf, ülke atıf ve bibliyografik ağ görselleştirmeleri VOSviewer yazılımı ile yapılmıştır.

Bulgular: 2021-2024 yılları arasında geleneksel ve tamamlayıcı tıp konulu onkoloji çalışmalarında belirgin bir artış olduğu tespit edilmiştir. Yayın sayısı ve atıf bakımından Amerika Birleşik Devletleri (ABD) ve Çin önde gelen ülkeler olarak öne çıkmıştır. Elsevier ve Springer Nature gibi yayınevlerinin bu alandaki araştırmaların yayılmasında önemli rol oynadığı görülmüştür. Mao

ABSTRACT

Nature played a significant role in disseminating research in this field. Highly cited works included studies by Mao and Zhang. Keyword analysis revealed central themes such as "integrative medicine", "complementary medicine", and "traditional Chinese medicine".

Conclusion: Between 2020 and 2024, there has been growing interest and increased scientific productivity in the field of traditional and complementary medicine in oncology. The USA and China have led this area in terms of publication volume and citations, while publishers like Elsevier and Springer Nature have significantly contributed to its dissemination.

Keywords: Traditional, complementary and alternative medicine (TCAM), oncology, bibliometric analysis

ÖZ

ve Zhang gibi araştırmacıların çalışmaları en yüksek atıf alan yayınlar arasında yer almıştır. Anahtar kelime analizinde "bütünleyici tıp" (*integrative medicine*), "tamamlayıcı tıp" (*complementary medicine*) ve "geleneksel Çin tıbbı" (*traditional Chinese medicine*) gibi terimlerin literatürde merkezi temalar olduğu belirlenmiştir.

Sonuç: 2020-2024 yılları arasında onkoloji alanında geleneksel ve tamamlayıcı tıp konularına olan ilginin arttığı ve bu alandaki bilimsel üretkenliğin yükseldiği görülmüştür. ABD ve Çin, hem yayın sayısı hem de atıf düzeyleri açısından alanın öncü ülkeleri olarak öne çıkarken, Elsevier ve Springer Nature gibi yayınevleri, alanın gelişimine önemli katkılar sağlamıştır.

Anahtar Kelimeler: Geleneksel, tamamlayıcı ve alternatif tıp (GTAT), onkoloji, bibliyometrik analiz

Introduction

Cancer, a multifaceted and life-threatening disease, continues to pose significant challenges to global public health. Despite advancements in medical science, the complexity of oncological diseases necessitates exploring various therapeutic strategies to address patients' physical, emotional, and psychological needs (1). Global projections suggest that, assuming current incidence trends continue, the overall incidence of cancer will double by 2070 compared with 2020 levels (2). As the prevalence of cancer increases, interest in traditional, complementary and alternative medicine (TCAM; hereafter TCAM) as complementary or independent approaches to conventional oncology is also growing (3). In this context, TCAM is increasingly utilized worldwide as adjunctive therapy in cancer care (4). Traditional medicine encompasses practices rooted in cultural and historical contexts, such as traditional Chinese medicine (TCM; hereafter TCM), Ayurveda, and herbal remedies, which have been tested over time. These systems often emphasize holistic well-being and integrate natural products such as medicinal herbs, acupuncture, and dietary therapies (5). In contrast, alternative medicine refers to non-traditional treatment approaches that are applied instead of conventional therapies (6). Although the lines distinguishing traditional medicine from alternative medicine are often blurred, each typically shares common characteristics for supportive care in oncology, particularly in the management of symptom control, enhancement of quality of life, and the management of side effects resulting from more conventional treatments (7). The use of TCAM among adult cancer patients is increasing and has become widespread; recent research indicates that 87% of individuals with cancer have utilized at least one type of TCAM therapy following their diagnosis (8).

Recent studies across diverse healthcare contexts reinforce the increasing use of TCAM among cancer patients. In Sweden, Wode et al. (9) reported that 34% of patients had used TCAM at some point in their lives, with natural products, vitamins, and TCM being the most common choices. Participants highlighted improvements in physical, emotional, and spiritual well-being as key benefits. A study conducted in Canada by Buckner et al. (10) found that approximately 50% of cancer patients utilized biologically based TCAM, with vitamins and minerals being the most frequently reported modalities. The study further noted that TCAM use tended to increase following diagnosis and was often perceived by patients as a strategy to enhance their sense of control during treatment. Nonetheless, the findings highlighted a lack of sufficient communication between patients and healthcare providers regarding TCAM practices. Among Chinese-speaking patients in Canada, Balneaves et al. (11) observed that decisions to use herbal and energy-based therapies were strongly shaped by cultural values and community support, underlining the sociocultural dimensions of TCAM adoption. In France, a prospective investigation by Gras et al. (12) revealed high engagement with osteopathy, acupuncture, and reflexology, which patients found particularly helpful in mitigating side effects and enhancing satisfaction with care. Similarly, a cross-sectional study in Iran indicated that more than 80% of patients engaged with herbal remedies and supplements, although knowledge levels varied widely, signaling a need for greater patient education (13). In Egypt, Abdelmoaty et al. (14) documented that 64.8% of patients incorporated TCAM into their cancer management-mostly honey and herbal medicine. Notably, 43% did not disclose this usage to their physicians, and over 90% believed that their doctors would disapprove. The study also found that TCAM use was significantly associated with being younger, female, more educated, and having prior experience with TCAM before cancer diagnosis, suggesting identifiable sociodemographic trends.

Several bibliometric studies have previously addressed the intersection of TCAM and oncology. For instance, Yang et al. (15) conducted a foundational network-based bibliometric analysis covering the period between 1989 and 2018, highlighting global collaboration patterns and thematic clusters in TCAM applications for cancer care. Similarly, Moral-Munoz et al. (16) examined the integrative and complementary oncology literature indexed in the Web of Science (WoS) from 1976 to 2017, with

a focus on production trends, international collaborations, and research hotspots such as apoptosis and oxidative stress. While both studies offered valuable historical perspectives, their findings did not reflect the evolving research dynamics and shifting priorities that emerged in the post-2019 era. On the other hand, Maria Helha and Wang (17) provided a bibliometric evaluation of TCAM usage in the context of common mental disorders rather than oncology, drawing on Scopus data from 2001 to 2020. Although thematically relevant, their focus diverges significantly from cancer-specific TCAM applications.

In contrast to these earlier efforts, this study offers a focused and up-to-date bibliometric network analysis of TCAM research in oncology covering the period from 2020 to 2024. By leveraging advanced bibliometric tools such as VOSviewer and Bibliometrix, and restricting the dataset to the WoS Core Collection, this study systematically maps co-authorship networks, institutional collaborations, keyword co-occurrences, and emerging thematic trends within the field. Moreover, it aims to bridge the temporal gap left by earlier analyses by capturing recent post-pandemic research dynamics, evolving global collaborations, and shifting thematic priorities in integrative oncology.

Methods

Since this research was based on secondary data obtained from the WoS database and involves no human subjects, ethical approval was not required. Therefore, patient consent was not necessary.

Study Design and Sample

This study adopts a bibliometric analysis approach to examine academic publications related to TCAM in the field of oncology. The sample consists of scientific articles indexed in the WoS Core Collection within the categories of Science Citation Index (SCI), Social Sciences Citation Index (SSCI), and Emerging Sources Citation Index (ESCI), published between 2020 and 2024.

Inclusion Criteria

1. Articles indexed in the WoS Core Collection (SCI, SSCI, and ESCI categories).

2. Publications dated between January 1, 2020, and December 31, 2024.

3. Articles published in English or other languages, provided that sufficient bibliometric information is available.

4. Original research articles focusing on TCAM in the context of oncology.

Exclusion Criteria

1. Publications dated outside the specified time frame (before January 1, 2020 or after December 31, 2024).

2. Non-research article types such as editorials, letters, conference abstracts, and commentaries.

3. Articles not directly related to TCAM in the context of oncology.

4. Articles lacking sufficient bibliometric data for inclusion in network analysis (e.g., missing author information, citation metadata).

A total of 2032 records were retrieved from the WoS Core Collection. After removing duplicates and applying the inclusion and exclusion criteria, 1884 articles were included in the final bibliometric analysis (Figure 1).

Data Collection Tools

The data were collected from the WoS Core Collection database. The search strategy was defined as: TS=(oncology or cancer) and TS=(traditional medicine or complementary medicine or alternative medicine or "TCAM" or "integrative medicine" or "complementary and integrative medicine"). The following framework guided the data collection process (Table 1).

Statistical Analysis

The statistical analysis in this study was conducted using VOSviewer 1.6.19.0 software. Within the scope of the analysis, several bibliometric parameters were examined, including the most cited studies, the annual distribution of publications, the languages in which they were published, the countries with the highest number of publications and citations, the most prolific publishers and journals, and the most frequently represented subject areas. In addition to these quantitative indicators, visual mapping techniques were employed to gain deeper insights into the structure of the scientific literature. Specifically, co-authorship networks, author citation networks, and author co-citation networks were analyzed. Furthermore, the citation relationships among countries, the co-occurrence of keywords used in the articles, and the bibliographic coupling of texts were also mapped and interpreted to uncover intellectual linkages and collaborative patterns in the field of TCAM in oncology.

Results

This section of the research presents findings on TCAM in oncology, including the number of highly cited publications, distribution by year and language, the country with the highest number of publications and citations, a list of the most prolific publishers and journals, a list of the primary fields with the most publications, co-author network analysis, author citation network analysis, author co-citation network analysis, country citation analysis, keyword co-occurrence analysis, and bibliographic coupling analysis of the texts. The first research question, "What are the most cited studies related to TCAM in the field of oncology?" presents information regarding the top 10 most cited articles in Table 2.

According to the research findings, the study titled "Integrative Oncology: Addressing the Global Challenges of Cancer Prevention and Treatment" by Mao et al. (1) is the most cited work in the field of TCAM in oncology, with 264 citations. This
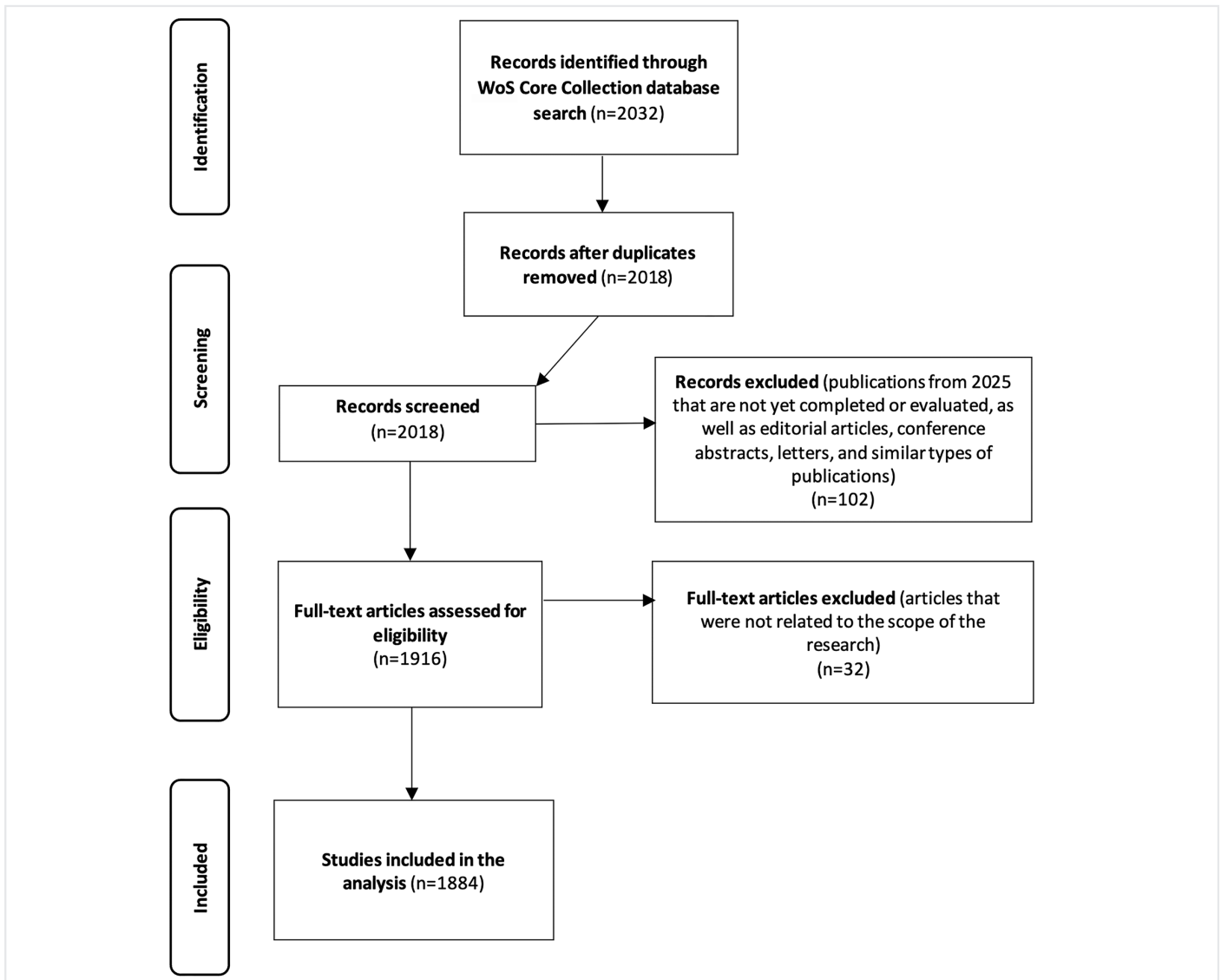
Figure 1. *PRISMA

*A total of 2032 records were retrieved from the WoS Core Collection. After removing duplicates and applying the inclusion and exclusion criteria, 1884 articles were included in the final bibliometric analysis.

PRISMA: Preferred reporting items for systematic reviews and meta-analyses, WoS: Web of Science

study addresses the global challenges of integrative oncology in cancer prevention and treatment, discussing how these approaches can be combined with both traditional and modern medical perspectives. The second most cited work is the research titled "The Positive Role of TCM as an Adjunctive Therapy for Cancer" by Zhang et al. (6), which has received 224 citations. This study emphasizes the positive effects of TCM as an adjunctive therapy in cancer treatment and examines the importance of integrating these therapies with biomedical applications. The third-ranked study is the article titled "Cellular Senescence and Cancer: Focusing on TCM and Natural Products" by Liu et al. (18), which has received 185 citations. This study investigates the relationship between cellular senescence and cancer, focusing on

the potential roles of TCM and natural products in this process. The findings illuminate the field's development from both clinical and theoretical perspectives, underscoring its significance in the academic community literature.

Upon examining Figure 2, it is notable that there has been a significant increase in publications related to TCAM in the field of oncology over the years. Particularly after 2020, there was a marked rise in the number of publications, with continued interest evident in 2021 and subsequent years. This trend indicates that the topic is gaining increasing importance in the academic realm and that researchers' interest in this area is rising. According to Figure 3, it is observed that a vast majority of studies related to TCAM in the field of oncology are written in English

Table 1. Search frame	
Parameters	Selection
Selection approach	Bibliometric analysis
Database used	WoS Core Collection
Tools used for analysis	VOSviewer
Search query	TS=(oncology or cancer) and TS=(traditional medicine or complementary medicine or alternative medicine or "traditional, complementary and alternative medicine" or "integrative medicine" or "complementary and integrative medicine")
Nature of the document	Article
Time period	2020-2024
Subject area	All areas
Total number of documents for analysis	1884
Publication stage	Published
WoS: Web of Science, VOSviewer: Visualization of similarities viewer, TS: Topic	

Table 2. Information on the top 10 most cited articles				
Article name	Authors	Year	Journal	Number of citations
Integrative oncology: addressing the global challenges of cancer prevention and treatment	Mao et al. (1)	2022	CA Cancer J Clin	264
The positive role of traditional Chinese medicine as an adjunctive therapy for cancer	Zhang et al. (6)	2021	Biosci Trends	224
Cellular senescence and cancer: focusing on traditional Chinese medicine and natural products	Liu et al. (18)	2020	Cell Prolif	185
Traditional Chinese medicine and lung cancer-from theory to practice	Li et al. (19)	2021	Biomed Pharmacother	168
The signaling pathways and targets of traditional Chinese medicine and natural medicine in triple-negative breast cancer	Yang et al. (20)	2021	J Ethnopharmacol	152
Integrative medicine for pain management in oncology: society for integrative oncology-American Society of Clinical Oncology guideline	Mao et al. (21)	2022	J Clin Oncol	150
Metabolic reprogramming by traditional Chinese medicine and its role in effective cancer therapy	Wang et al. (22)	2021	Pharmacol Res	135
Benzimidazole and its derivatives as cancer therapeutics: the potential role from traditional to precision medicine	Lee et al. (23)	2023	Acta Pharm Sin B	124
Clinical application and mechanism of traditional Chinese medicine in treatment of lung cancer	Su et al. (24)	2020	Chin Med J (Engl)	103
Traditional Chinese medicine as supportive care for the management of liver cancer: past, present, and future	Liao et al. (7)	2020	Genes Dis	95

(1838 publications). The number of publications in other languages is limited; German ranks second with 32 publications. According to Figure 4, Ben-Arye E is the most prolific author in studies related to TCAM in oncology, with 50 publications. This highlights Ben-Arye E's significant contributions to the field and the wide recognition of their work within academic circles. Following Ben-Arye E and Samuels N with 42 publications and Cramer H with 28 publications. Other notable authors include Witt CM with 25 publications, and Gressel O, Lopez G, Ng JY, and Mao JJ each with 22 publications. This trend indicates that research on TCAM in oncology necessitates a multidisciplinary approach and is examined from various perspectives by different researchers. The work of leading authors like Ben-Arye E and Samuels N has established foundational methodologies in the field and serves as important reference points in the academic literature. According to Figure 5, the United States of America (USA) is the clear leader in publication output, with 570 studies on TCAM in oncology, reflecting the country's pioneering role in global health research and its comprehensive academic infrastructure. Following the USA, China ranks second with 448 publications, a position that can be linked to the historical roots of TCM and the increasing integration of these approaches into modern oncology. However, as shown in Figure 6, China leads in citation impact with 3,478 citations, indicating that its research is highly influential and widely referenced in the international academic community. The USA ranks second in citation count, with 2,829 citations, underscoring that while the USA demonstrates high research productivity, China's
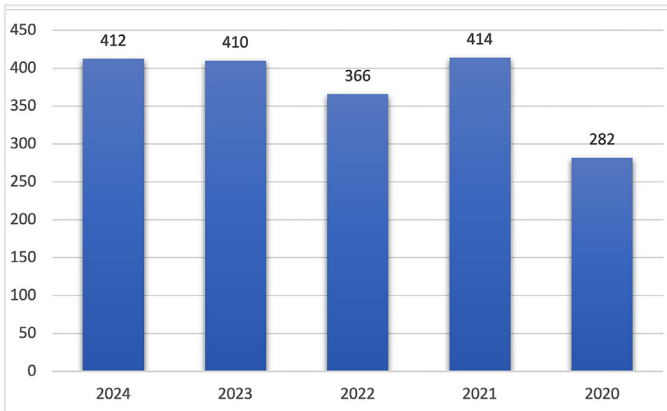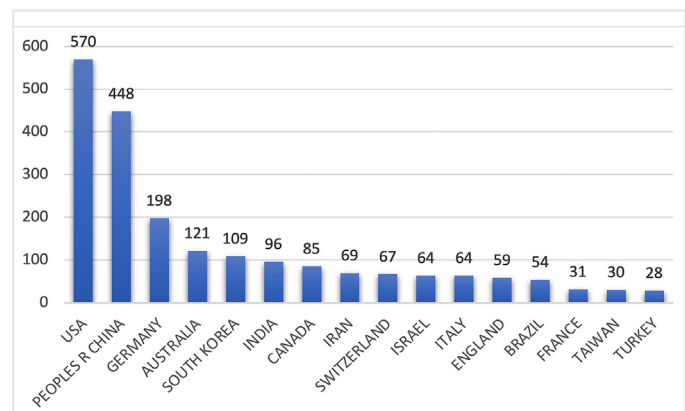
Figure 2. Distribution of studies by year

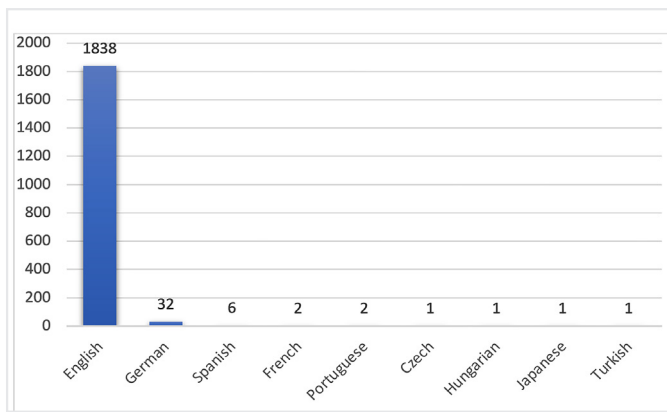**Figure 3.** Distribution of studies by language

Figure 4. Distribution of studies by authors

Figure 5. Distribution of studies by country

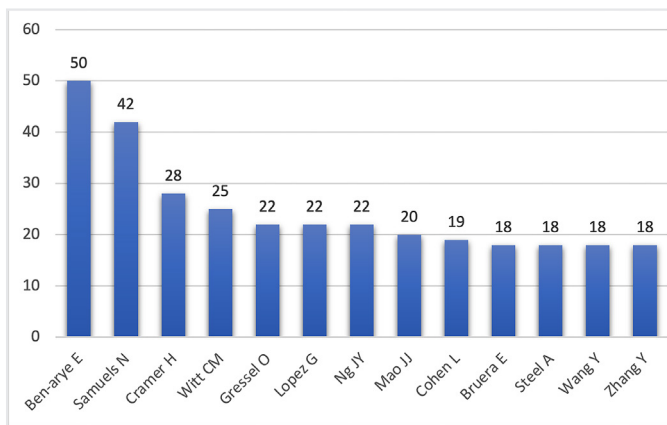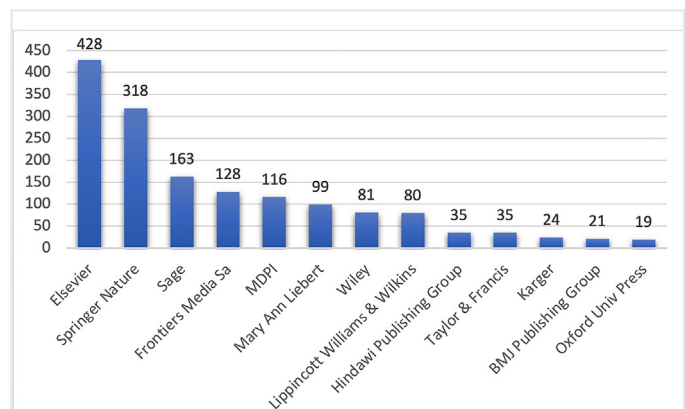**Figure 6.** Distribution of studies according to most cited countries

Figure 7. Distribution of studies by publishers

MDPI: Multidisciplinary Digital Publishing Institute

contributions have achieved greater visibility and impact in the global literature. According to Figure 7, in the distribution of studies on TCAM in the field of oncology by publishers, Elsevier stands out as the leading publisher with 428 publications. Elsevier's leading position is indicative of its extensive academic publishing network and strong presence in the field of health sciences. Following Elsevier, Springer Nature ranks second with 318 publications, reflecting Springer's strong position as a key player in multidisciplinary scientific publishing. Other prominent publishers include Sage (163 publications), Frontiers Media SA (128 publications), and Multidisciplinary Digital Publishing Institute (MDPI) Multidisciplinary Digital Publishing Institute (116 publications). These publishers contribute to the broader dissemination of research, mainly through their open-access and multidisciplinary approaches. According to Figure 8, in the distribution of studies on TCAM in the field of oncology by journals, Integr Cancer Ther stands out as the leading journal with 93 publications. This indicates that the journal

is a prominent platform for scientific publications related to complementary and integrative medicine in oncology. BMC Complement Med Ther ranks second with 62 publications and is noted for its open-access policies and broad multidisciplinary approach. Other significant journals include Front Pharmacol (50 publications), the J Integr Med (45 publications), and the Eur J Integr Med (43 publications). These journals contribute to the development of the field by serving as bridges between traditional medicine and modern pharmacology and integrative approaches. According to Figure 9, the primary field with the highest number of publications on TCAM in the field of oncology is Integrative Medicine (671 publications). This finding suggests that integrative medicine is a central focal point for combining traditional and modern approaches. The fields of oncology (312 publications) and medicine general (208 publications) rank second and third, respectively, suggesting that these areas are directly related to studies focused on oncology. Fields such as pharmacology (207 publications) and health care sciences (130 publications) emphasize the pharmacological dimensions of complementary medicine practices and their impact on health services. Although these fields have lower publication counts, areas like rehabilitation (78 publications), public environmental health (69 publications), and clinical neurology (56 publications) reflect the importance of interdisciplinary
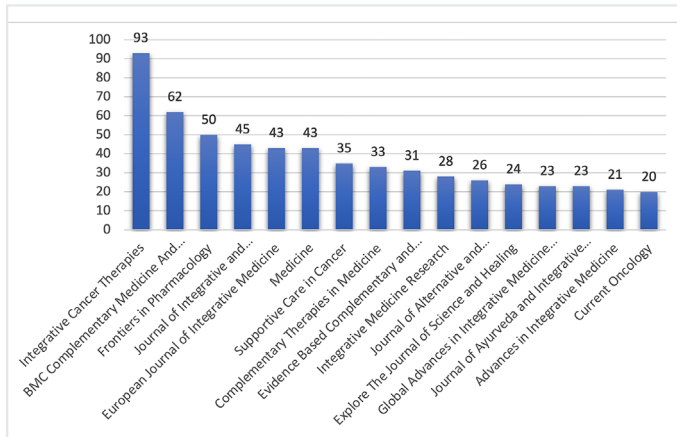

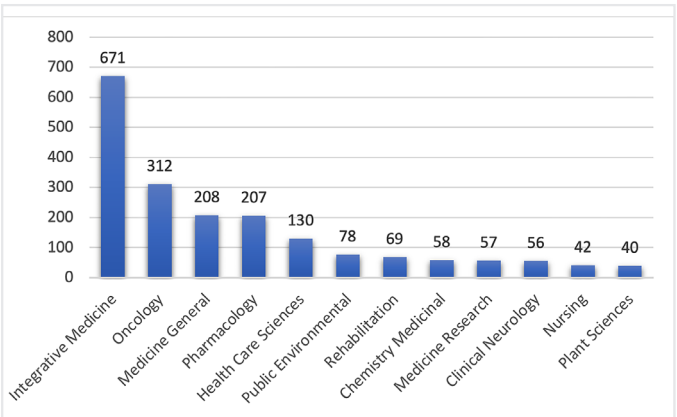**Figure 8.** Distribution of studies by journals

Figure 9. Main areas with most publications

approaches in this context. Nursing (42 publications) and plant sciences (40 publications) are among the other fields that provide more specific yet practical contributions to this area. These data indicate that studies on TCAM in the field of oncology not only attract interest in clinical practices but also engage various scientific disciplines through a multidisciplinary approach.

According to the co-author network analysis depicted in Figure 10, the analysis reveals a significant collaboration network among researchers working on TCAM in oncology, structured into five colour-coded clusters that represent cohesive thematic communities. The figure, which includes 29 authors, reveals dense collaboration among the authors. The visual proximity and clustering of authors suggest active intra- and inter-cluster collaboration patterns, especially around key nodes. Within the network, authors such as Ben-Arye E, Samuels N and Cramer H occupy central positions, making significant contributions to the literature in the field. Notably, Ben-Arye E stands out as one of the most influential figures in the network, with a connection strength of 97, playing an active role in both individual and collective scientific production. Cramer H appears to function as a connector between otherwise separate groups, supporting interdisciplinary knowledge exchange. Similarly, authors such as Samuels N and Lopez G possess high connection strength, reinforcing their visibility and integrative role across research clusters. According to the author citation network analysis presented in Figure 11, there are 24 authors and four distinct clusters. Among these authors, 127 connections were identified, highlighting their strong citation relationships. Within the network, Ben-Arye E occupies a central position with a total connection strength of 404 and has a strong citation network with many other authors. This indicates that Ben-Arye E is frequently referenced in studies related to TCAM in oncology. In Figure 12, the author co-citation network related to TCAM in oncology is visualized, showing the connections among authors who are cited together in different articles. According to the network analysis, there are 25 authors and three distinct clusters. Among these authors, 271 connections were identified, demonstrating the interconnected structure of the literature in the field. Authors such as Mao JJ, Ben-Arye E and Witt CM occupy central positions within the network. Notably, Mao JJ stands out as one of the most influential authors, with a total connection strength of 804. This indicates that Mao's work is frequently referenced in the literature and has a broad impact. Other authors, such as Ben-Arye E and Witt CM also form significant nodes in the network with high connection strength, emerging as reference points in the interdisciplinary literature. The network graph in Figure 12 is divided into clusters of different colors. Each color represents a specific theme or research focus. For instance, Mao JJ and Ben-Arye E are concentrated in the red cluster, while authors such as the WHO and Ernst E are situated in the green cluster. In the blue cluster, Asian-origin researchers like Zhang Y and Wang Y stand out. Figure 13 illustrates the inter-country citation network analysis within the context of TCAM studies in oncology. The analysis includes a total of 24 countries and five different clusters, with 175 connections between the countries. This finding highlights
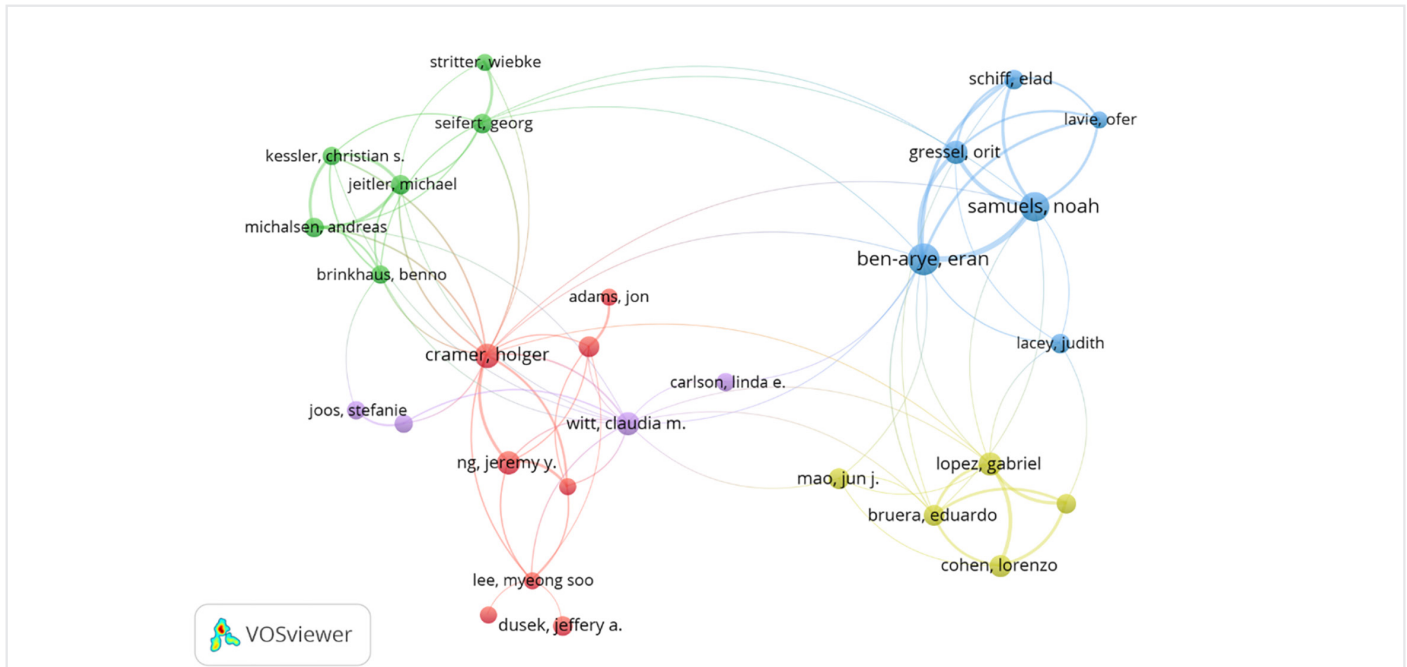
Figure 10. Co-author network analysis
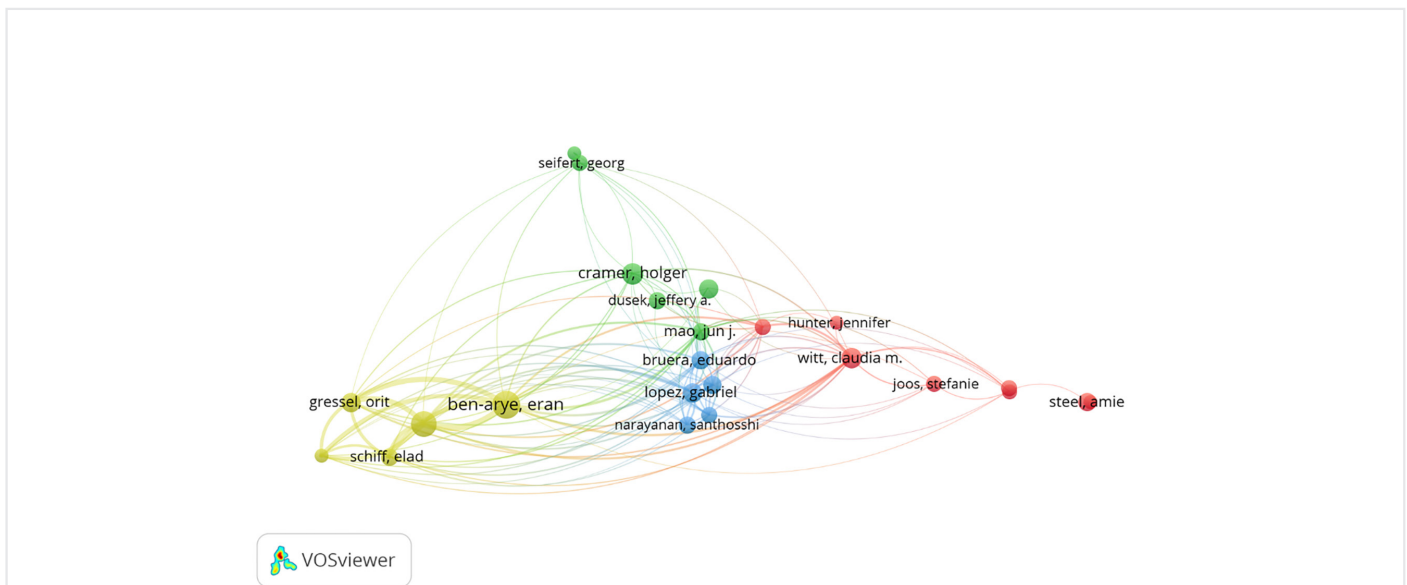
Figure 11. Author citation network analysis

the strong academic interactions and collaborations among the countries. The USA, located at the center of the network, holds the most influential position with a total connection strength of 649. The USA has particularly intense citation connections with China, the United Kingdom, Germany, South Korea, and Australia. This indicates that the USA is leading in international literature and frequently referenced by other countries. China, with a total connection strength of 209, is another central country in the network. China has a strong citation relationship with the USA, indicating that both countries are pioneering in the literature. Additionally, China's connections with Asian

and Western countries further enhance its global influence in this area. This influence is particularly rooted in China's leadership in TCM, which represents a significant thematic pillar within TCAM research in oncology. The increasing global recognition of TCM-based therapies-such as acupuncture, herbal medicine, and energy-based practices grounded in the concept of Qi (the traditional notion of vital life energy)-has further elevated China's prominence in scholarly discourse. The strong citation linkage between China and the USA reflects a broader convergence of Eastern and Western medical paradigms, especially in fields related to symptom management, palliative

care, and the integration of evidence-based complementary therapies into cancer treatment. Figure 14 presents the keyword co-occurrence analysis of articles related to TCAM in oncology. According to the analysis, there are a total of 48 keywords and five different clusters. In total, 561 connections were identified, demonstrating how frequently the keywords are used and how central they are in the literature. The most prominent keyword is "Integrative Medicine", which appears 381 times, making it the network's largest and most central node. This term indicates that the studies are primarily focused on integrative medicine. Other keywords, such as "Complementary Medicine" (138 times) and "TCM" (195 times), also represent focal points of the research. Additionally, terms like "Cancer" (151 times), "Acupuncture"

(120 times), and "Quality of Life" (70 times) signify important topics in the field.

The clusters represented by colors illustrate the relationships between specific themes. For example, the red cluster, which includes terms such as "TCM", "Chemotherapy", and "Apoptosis", focuses on traditional medicine and cancer biology. In contrast, the blue cluster, which contains terms like "Integrative Oncology", "Pain", and "Palliative Care", represents studies related to integrative oncology and the quality of life for patients. These clusters not only reveal thematic orientations but also demonstrate how TCAM research in oncology is diversifying. The blue cluster also groups mind-body approaches
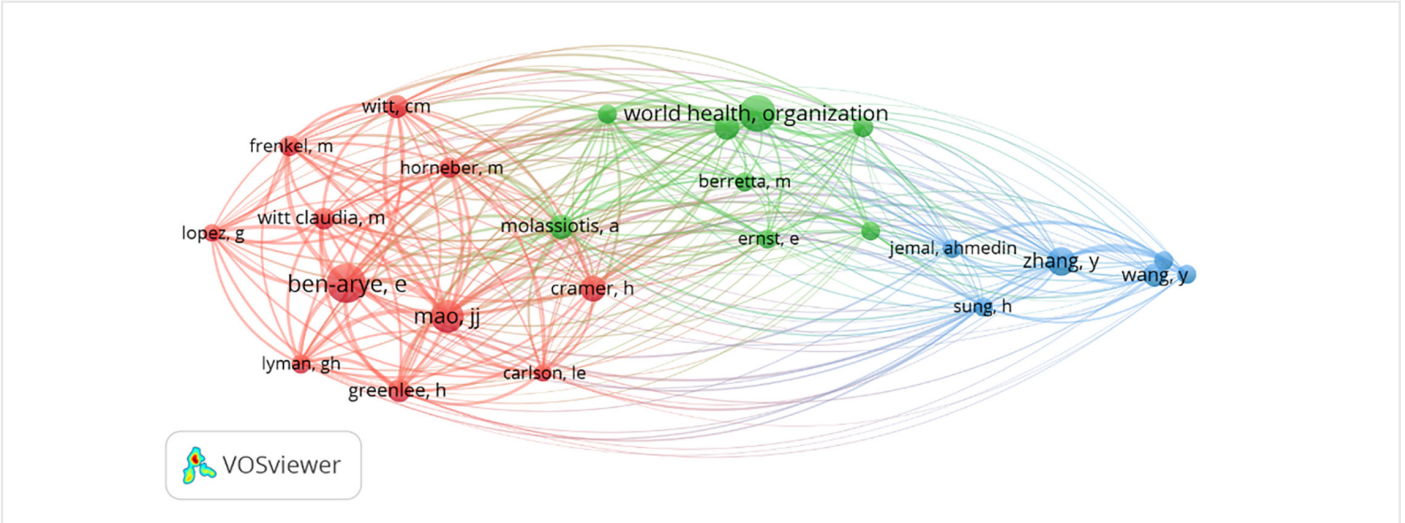

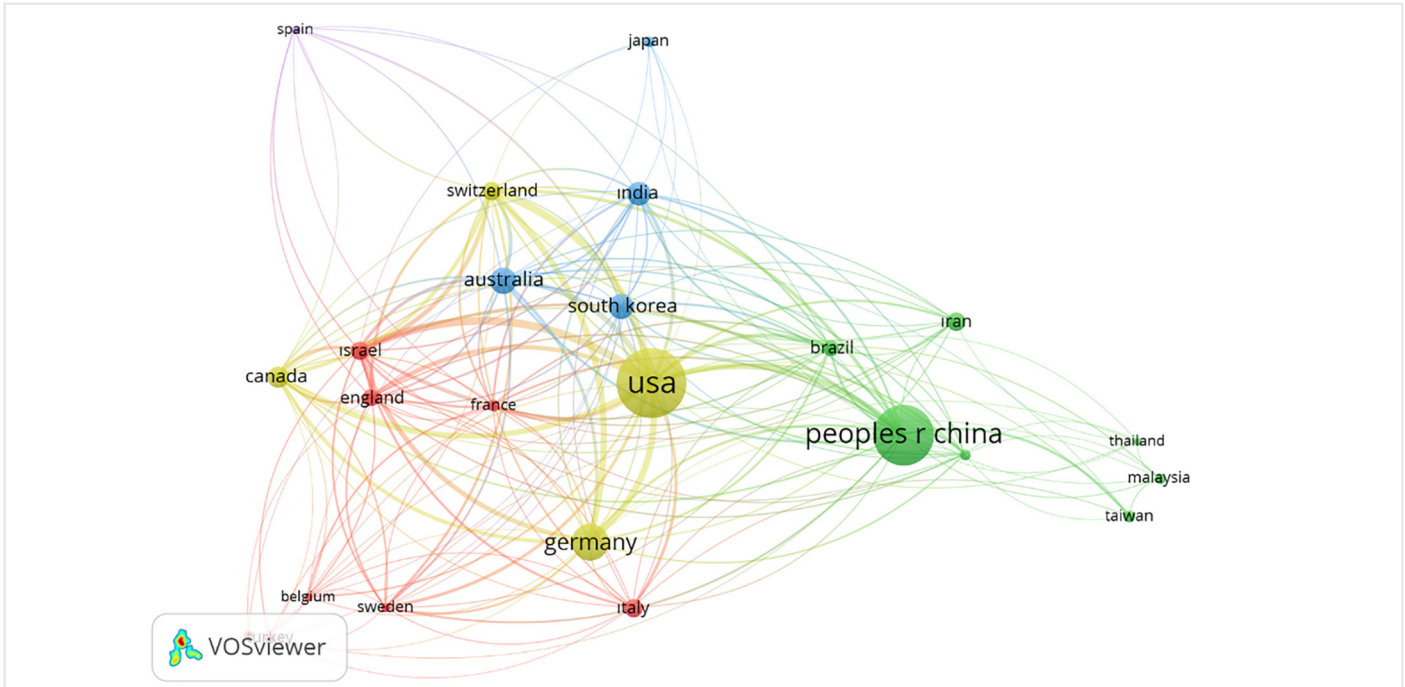**Figure 12.** Author co-citation network analysis

Figure 13. Country citation network analysis

such as "yoga", "meditation", and "pain", indicating a focus on symptom relief and emotional well-being. In contrast, the red cluster centers around "TCM", "chemotherapy", and "apoptosis", suggesting a strong connection between herbal or traditional interventions and biological mechanisms of cancer treatment. The green cluster encompasses terms like "qualitative research", "complementary therapies", and "education", reflecting interest in patient experience, healthcare delivery, and the integration of

TCAM into clinical contexts. Figure 15 presents the bibliographic coupling analysis of texts related to TCAM in oncology. This analysis visualizes the key reference points in the literature and the impact of research in the field. The bibliographic analysis identifies 14 authors and three different clusters, with 91 connections among the authors. Ben-Arye E and Samuels N emerge as the most decisive nodes at the center of the network. Ben-Arye E, with a connection strength of 11,414, demonstrates
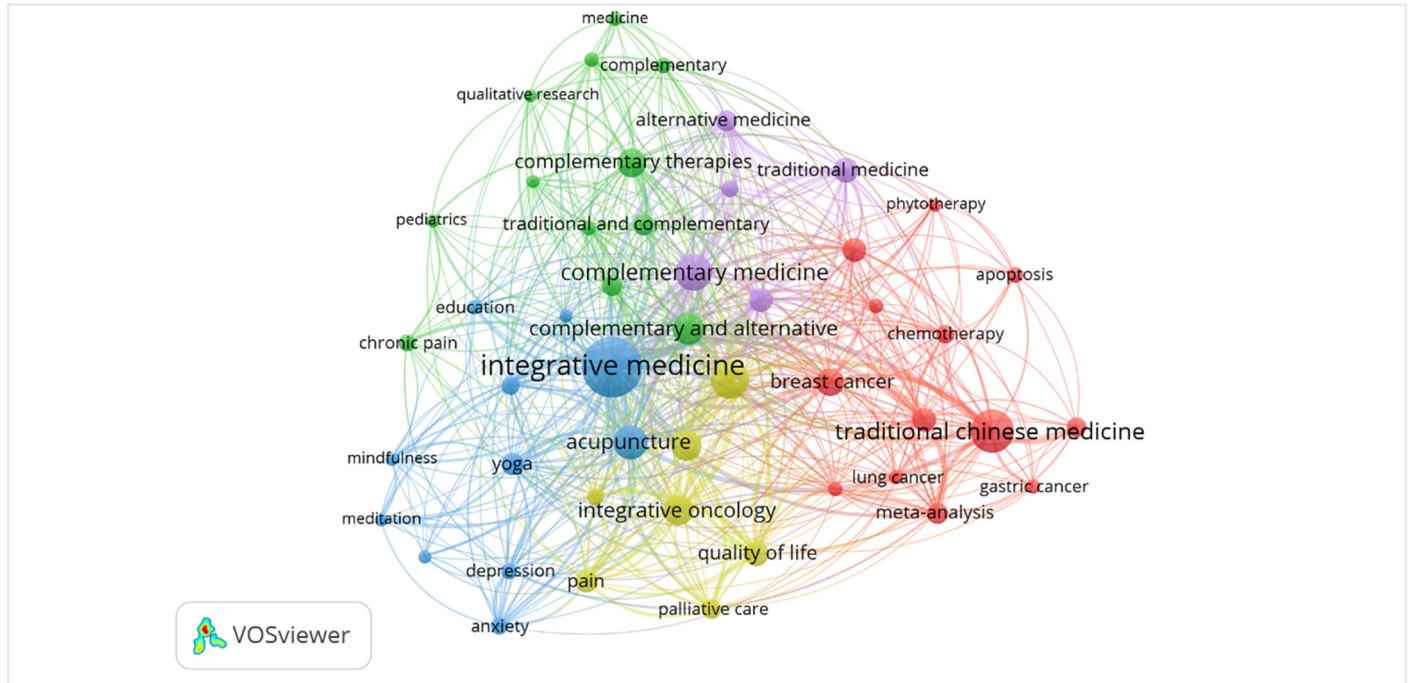
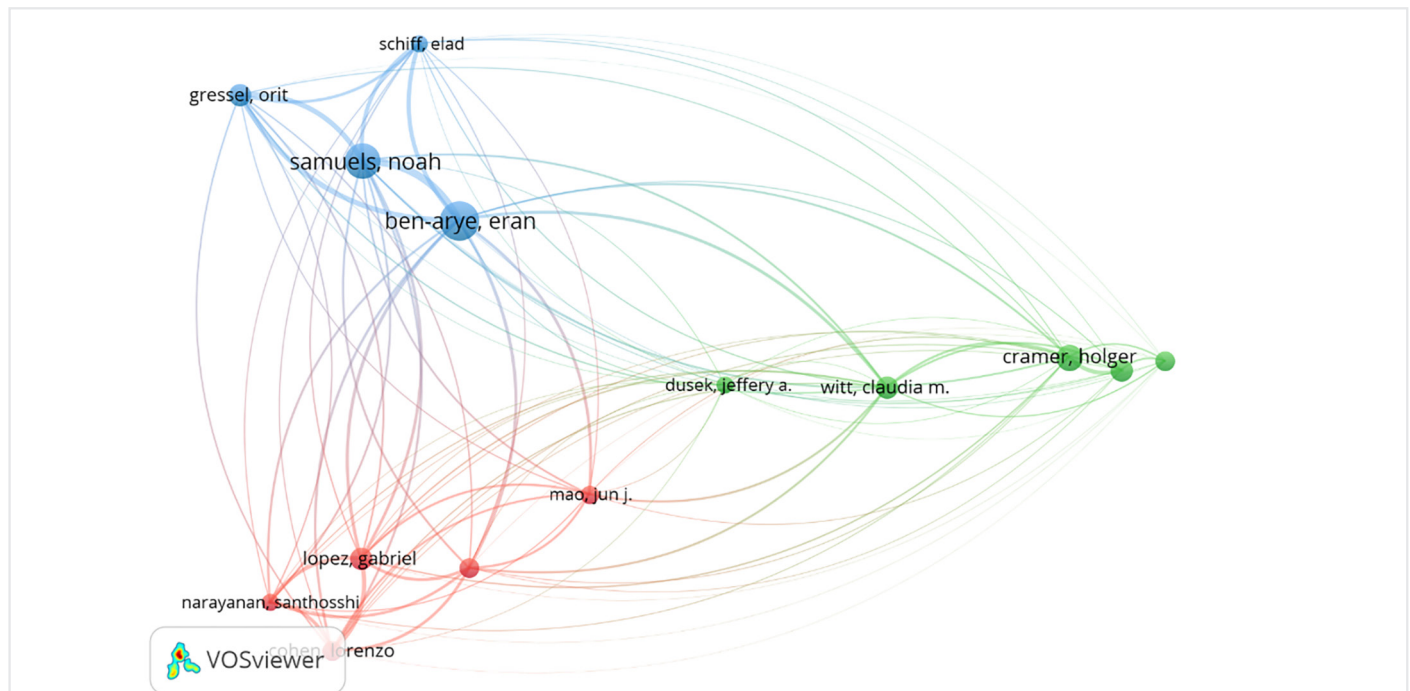

Figure 14. Keyword co-occurrence analysis

Figure 15. Bibliographic coupling analysis

his central position in the literature, indicating that his works are frequently referenced in the field's literature and serve as a guiding source for other research. Samuels N and Cramer H are also important nodes, standing out as key actors in the literature. Another notable node in the network is Mao JJ, who has an interdisciplinary impact and significantly contributes to the flow of information in research studies. Additionally, despite being smaller nodes, authors like Lopez G and Witt CM enhance interactions in the field's literature by establishing important connections. This analysis provides an important framework for understanding which authors have established the foundational pillars of the literature in TCAM studies in oncology and how they guide the flow of information. Names such as Ben-Arye E, Samuels N, and Mao JJ are key reference points in the field and shape the literature.

Discussion

The findings of this bibliometric network analysis suggest the rising global interest in TCAM within oncology. Over the 2020-2024 period, there has been a marked increase in academic publications focusing on integrative approaches, reflecting a broader transformation in how cancer care is conceptualized - not merely as a clinical intervention but as a holistic process that addresses the physical, emotional, and psychosocial needs of patients. The leading roles of countries such as the USA and China demonstrate both scientific investment and cultural heritage in this area. While the USA contributes through structured academic research and interdisciplinary collaboration, China brings the historical depth of TCM into contemporary scientific frameworks. This mutual exchange has strengthened international scholarly collaboration and enriched the thematic diversity observed in this study. The keyword and thematic cluster analyses reveal a focused interest in terms like "integrative medicine", "TCM", "complementary therapies", and "quality of life", suggesting that the field has begun to coalesce around shared priorities and research goals. This suggests a transition from isolated studies to more structured, cumulative knowledge production that supports the integration of TCAM into evidence-based oncology practices. Co-authorship and citation network analyses also identify authors such as Ben-Arye E, Mao JJ, and Samuels N as central figures, indicating their influence in shaping the scholarly landscape of integrative oncology.

When compared with earlier bibliometric investigations, the results of this analysis both reaffirm and expand upon prior findings. Yang et al. (15) covering publications from 1989 to 2018, identified dominant themes related to herbal treatments and symptom management. The current analysis shows that while these topics remain relevant, there has been a notable thematic shift toward psychosocial interventions, including mindfulness and yoga, indicating a transition toward more patient-centered research. Similarly, Moral-Munoz et al. (16) emphasized apoptosis and oxidative stress as core topics in literature indexed before 2017. In contrast, the present keyword network identifies "quality of life" and "palliative care" as more central, reflecting updated research priorities aligned with supportive care. Maria Helha and

Wang (17), focusing on TCAM in mental health contexts, noted increased publication rates in recent years. A comparable trend is observed in the oncology-specific literature, suggesting that the growing interest in CAM spans multiple medical disciplines and is driven by broader shifts toward holistic health paradigms. From a methodological perspective, the country-level citation network highlights intensified scholarly exchange between the USA and China, a pattern not as pronounced in earlier studies. Moreover, the emergence of multidisciplinary clusters-including terms associated with qualitative research, patient communication, and implementation-points to a diversification of research agendas in TCAM-oncology. These developments may significantly influence guideline formulation and service delivery models in the near future.

Recent high-impact studies substantiate the clinical relevance of TCAM in oncology. Mao et al. (1) reported that integrative oncology protocols attenuate treatment-related toxicity and improve long-term survivorship outcomes. Zhang et al. (6) observed enhanced chemotherapy tolerance and better symptom control when TCM is delivered as an adjuvant modality. Liu et al. (18) highlighted anti-senescence pathways activated by specific herbal compounds, thereby identifying molecular targets for future drug development. Taken together, these findings suggest that TCAM interventions contribute not only to supportive care but also to disease-modifying strategies in contemporary cancer management. From a managerial perspective, the expanding evidence base supports the inclusion of integrative oncology services in cancer centers, the re-allocation of resources toward multidisciplinary teams, and the development of reimbursement models that cover validated TCAM interventions. Such alignment is expected to improve patient satisfaction, streamline care pathways, and potentially reduce overall treatment costs.

Study Limitations

This study is limited to data retrieved exclusively from the WoS Core Collection database. Although databases such as Scopus, PubMed, or Google Scholar offer broader or more specialized coverage, the WoS was selected to ensure data consistency, avoid duplicate records, and maintain compatibility with bibliometric analysis tools. The WoS is widely preferred in bibliometric studies due to its structured metadata and established citation indexing standards.

Additionally, the analyzed studies cover only the period between 2020 and 2024. This specific time frame was deliberately chosen because a previous comprehensive bibliometric study by Yang et al. (15) had already examined the literature on TCAM in oncology from 1989 to 2018. By beginning with the year 2020, the present study aims to provide an updated continuation of that earlier work and to better reflect recent shifts and trends in the literature.

Conclusion

This study presents a comprehensive bibliometric analysis covering 1884 studies on TCAM in oncology between 2020 and 2024. The findings demonstrate a significant increase in research

activity in this area, particularly between 2021 and 2024, with a focus on integrative approaches. The majority of the studies were published in English, and countries such as the USA, China, and Germany emerged as the leading contributors to the literature. Publishers including Elsevier, Springer Nature, and MDPI played a key role in disseminating research in this field. Co-authorship and citation network analyses highlight the central position of authors such as Ben-Arye E, Mao JJ, and Samuels N who have actively shaped interdisciplinary research in integrative oncology. Keywords such as "Integrative Medicine", "Complementary Medicine", and "TCM" represent the main research themes, while the prominent role of the USA and China in the global literature underscores the importance of international academic collaboration. Overall, these findings highlight the growing recognition of the need to integrate modern medicine and traditional approaches in oncology research.

This study has several limitations. The analysis was restricted to publications indexed in the WoS Core Collection and to the 2020-2024 period, which may have excluded relevant studies from other databases or earlier years. The reliance on bibliometric indicators also emphasizes citation quantity over content quality or clinical impact, and the predominance of English-language publications may underrepresent important regional or non-English contributions. Future research should aim to expand the data sources to include databases such as Scopus, PubMed, and regional indexes, enabling a more comprehensive mapping of global scholarly activity. Additionally, integrating bibliometric data with clinical and economic outcomes-such as treatment efficacy, patient satisfaction, and cost-effectiveness-would help bridge the gap between academic influence and real-world applicability. In summary, the integration of TCAM with contemporary oncological approaches is likely to gain increasing importance in the coming years and has the potential to contribute significantly to evidence-based, patient-centred cancer care.

Ethics

Ethics Committee Approval: Since this research was based on secondary data obtained from the WoS database and involves no human subjects, ethical approval was not required.

Informed Consent: Therefore, patient consent was not necessary.

Footnotes

Authorship Contributions

Concept: B.A., F.A., B.T., A.İ., Design: B.A., B.T., A.İ., Data Collection or Processing: F.A., M.B.D., Analysis or Interpretation: F.A., B.T., M.B.D., A.İ., Literature Search: B.A., M.B.D., Writing: B.A., F.A., B.T., M.B.D., A.İ.

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References

1. Mao JJ, Pillai GG, Andrade CJ, Ligibel JA, Basu P, Cohen L, et al. Khan IA, et al. Integrative oncology: addressing the global challenges of cancer prevention and treatment. CA Cancer J Clin. 2022;72:144-64.

2. Soerjomataram I, Bray F. Planning for tomorrow: global cancer incidence and the role of prevention 2020-2070. Nat Rev Clin Oncol. 2021;18:663-72.

3. World Health Organization. WHO global report on traditional and complementary medicine 2019. [cited 2025 May 25]. Available from: https://www.who.int/publications/i/item/978924151536

4. Zia FZ, Olaku O, Bao T, Berger A, Deng G, Fan AY, et al. The National Cancer Institute's Conference on acupuncture for symptom management in oncology: State of the Science, Evidence, and Research Gaps. J Natl Cancer Inst Monogr. 2017;2017:lgx005.

5. Kleebayoon A, Wiwanitkit V. Role of traditional and alternative medicine in cancer therapy. In: Interdisciplinary Cancer Research. Cham: Springer; 2024:1-29.

6. Zhang X, Qiu H, Li C, Cai P, Qi F. The positive role of traditional Chinese medicine as an adjunctive therapy for cancer. Biosci Trends. 2021;15:283-98.

7. Liao X, Bu Y, Jia Q. Traditional Chinese medicine as supportive care for the management of liver cancer: past, present, and future. Genes Dis. 2019;7:370-9.

8. Judson PL, Abdallah R, Xiong Y, Ebbert J, Lancaster JM. Complementary and alternative medicine use in individuals presenting for care at a comprehensive cancer center. Integr Cancer Ther. 2017;16:96-103.

9. Wode K, Henriksson R, Sharp L, Stoltenberg A, Hök Nordberg J. Cancer patients' use of complementary and alternative medicine in Sweden: a cross-sectional study. BMC Complement Altern Med. 2019;19:62.

10. Buckner CA, Lafrenie RM, Dénommée JA, Caswell JM, Want DA. Complementary and alternative medicine use in patients before and after a cancer diagnosis. Curr Oncol. 2018;25:e275-81.

11. Balneaves LG, Wong ME, Porcino AJ, Truant TLO, Thorne SE, Wong ST. Complementary and alternative medicine (CAM) information and support needs of Chinese-speaking cancer patients. Support Care Cancer. 2018;26:4151-9.

12. Gras M, Vallard A, Brosse C, Beneton A, Sotton S, Guyotat D, et al. Use of complementary and alternative medicines among cancer patients: a single-center study. Oncology. 2019;97:18-25.

13. Amirmoezi F, Araghizadeh M, Mohebbinia Z, Kamfiroozi R, Haghpanah, S, Bordbar M. Use of complementary and alternative medicine among Iranian cancer patients in south of Iran. Int J Cancer Manag. 2017;10:e7233.

14. Abdelmoaty A, Amin TT, Obaid H, Adel O, Binti Hassan UH, Abdelazeim NA, et al. Complementary medicines among Egyptian oncology patients at a tertiary level of care: pattern and motives. Health Sci J. 2018;12:1-9.

15. Yang W, Hao X, Qu J, Wang L, Zhang M, Jiang Y, et al. Collaborative networks and thematic trends of research on the application of

complementary and alternative medicine in cancer patients: a bibliometric analysis. Complement Ther Clin Pract. 2019;37:58-67.

16. Moral-Munoz JA, Carballo-Costa L, Herrera-Viedma E, Cobo MJ. Production trends, collaboration, and main topics of the integrative and complementary oncology research area: a bibliometric analysis. Integr Cancer Ther. 2019;18:1534735419846401.

17. Maria Helha FN, Wang YP. Trends in complementary and alternative medicine for the treatment of common mental disorders: a bibliometric analysis of two decades. Complement Ther Clin Pract. 2022;46:101531.

18. Liu Y, Yang S, Wang K, Lu J, Bao X, Wang R, et al. Cellular senescence and cancer: focusing on traditional Chinese medicine and natural products. Cell Prolif. 2020;53:e12894.

19. Li Z, Feiyue Z, Gaofeng L. Traditional Chinese medicine and lung cancer--from theory to practice. Biomed Pharmacother. 2021;137:111381.

20. Yang Z, Zhang Q, Yu L, Zhu J, Cao Y, Gao X. The signaling pathways and targets of traditional Chinese medicine and natural medicine in triple-negative breast cancer. J Ethnopharmacol. 2021;264:113249.

21. Mao JJ, Ismaila N, Bao T, Barton D, Ben-Arye E, Garland EL, et al. Integrative medicine for pain management in oncology: society for integrative oncology-ASCO guideline. J Clin Oncol. 2022;40:3998-4024.

22. Wang S, Fu JL, Hao HF, Jiao YN, Li PP, Han SY. Metabolic reprogramming by traditional Chinese medicine and its role in effective cancer therapy. Pharmacol Res. 2021;170:105728.

23. Lee YT, Tan YJ, Oon CE. Benzimidazole and its derivatives as cancer therapeutics: the potential role from traditional to precision medicine. Acta Pharm Sin B. 2023;13:478-97.

24. Su XL, Wang JW, Che H, Wang CF, Jiang H, Lei X, et al. Clinical application and mechanism of traditional Chinese medicine in treatment of lung cancer. Chin Med J (Engl). 2020;133:2987-97.