Current Status and Future Prospects of Mindfulness in Cancer Patients: A Literature Review Using CiteSpace Bibliometric Analysis

Liu He[1,a,*], Jie Yao[1,b], Zhixuan Hu[2,c]

[1]School of Nursing, Shaanxi University of Chinese Medicine, Xianyang, China
[2]School of Nursing, Shaanxi University of Chinese Medicine, Xianyang, China
[a]690409831@qq.com, [b]344246303@qq.com, [c]1755030309@qq.com
*Corresponding author

Abstract: This study aims to analyze the current research status and trends of mindfulness in cancer, explore the current situation and shortcomings of research in this field, and provide a certain reference for further research and application of mindfulness. Retrieve relevant literature records from the Web of Science Core Collection and conduct visual analysis of authors, countries, institutions, and keywords using CiteSpace 6.1.R2 software. A total of 430 articles were retrieved, and the overall related research in this field showed a fluctuating upward trend. Research hotspots are concentrated in anxiety, depression, quality of life, breast cancer, mindfulness-based stress reduction (MBSR), etc. There is considerable room for expansion in mindfulness-related research and specific applications. In the future, mindfulness can be extended from multiple perspectives such as internet-based interventions, outpatient settings,and home-based treatments to explore more effective mindfulness intervention measures.

Keywords: Mindfulness; Cancer; CiteSpace; Knowledge Map Analysis; Mindfulness Therapy

1. Introduction

The International Agency for Research on Cancer has reported that there were 19.3 million new cases of cancer and nearly 10 million cancer deaths worldwide in 2020. It is estimated that by 2040 global cancer burden will reach 28.4 million cases which represents a 47% increase from 2020 [1]. Cancer patients often experience negative psychological complications with depression and anxiety being most common which not only affects their treatment outcomes but may also serve as an independent risk factor for increased cancer mortality rates. Mindfulness originated from Buddhist meditation practices as a self-regulation method formed through activities such as sitting meditation or contemplation [2]. In 1979 Dr.J.Kabat-Zinn introduced it into Western psychotherapy. Studies have shown positive effects of mindfulness interventions in reducing psychological stress[3]. Currently,mindfulness therapy has been widely applied in clinical care for cancer patients with positive therapeutic effects, and its popularity continues to grow.

To further understand the development trends regarding mindfulness therapy's role within oncology, this paper analyzes its current status using CiteSpace software, to discuss both present conditions & deficiencies within this field,and provide scholars with references for further study & application.

2. Materials and Methods

2.1. Data Source

This study utilized data from Web Of Science Core Collection database. The search formula included ((TS=mindfulness OR TS="Mindfulness therapy" OR TS="Mindfulness based therapy" OR TS="Mindfulness Meditation" OR TS="Mindfulness Practice" OR TS=MBSR OR TS= "Mindfullness based cognitive therapy" OR TS=MBCT OR TS= "mindfullness based stress reduction") AND (TS=cancer OR TS=tumor)). The search period ranged from January 1980 to December 2022. In WOS, a preliminary search was conducted to retrieve 1,222 papers, after which papers with duplicate publication, conference abstracts, and other irrelevant papers were excluded, resulting in the final

retrieval of 430 effective papers.

2.2. Inclusion and Exclusion Criteria

Inclusion criteria: topics include papers related to mindfulness and cancer. Exclusion criteria: (1)Repeated published literature; (2)conference papers; (3) experience exchange, nursing experience and other papers.

2.3. Research Method

CiteSpace6.1.R2 software was used for analysis. Firstly, a project folder was created containing four data folders named date,input, output, and project. Secondly, data transformation involved copying output files into date folder. Time slicing sets the publication date between January 1995 and December 2022, and the time interval is once a year. The node types selected for analysis and visualization include author, organization and keyword respectively.

3. Results

3.1. Time Distribution of Global Mindfullness Research Literature

Figure 1 shows distribution of literature publication dates from 2000 to 2022. WOS core data set first recorded a paper on mindfullness & cancer in 1995. From 1995 to 2011, the number of annual publications remained below 10. However, since 2014 the quantity has generally exhibited an upward fluctuating trend despite slight declines in 2014, 2016 and 2018.
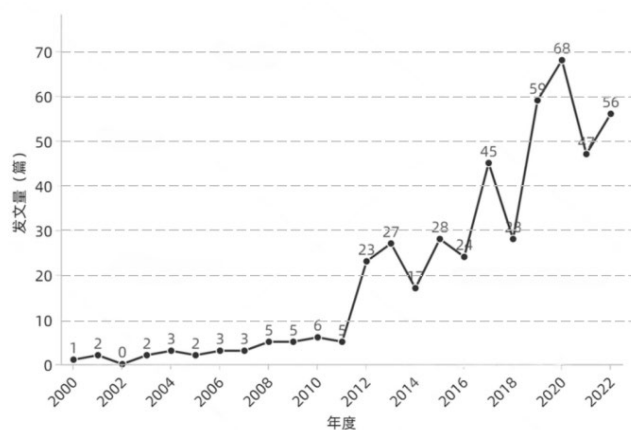

Figure 1: 2000-2022 literature publication date distribution

3.2. Analysis of Collaborative Institutions

Figure 2 illustrates collaboration among major research institutions with in WOS. Graph metrics N=310, E=498, Density=0.0104. Mainly composed of universities & medical research institutes, top five institutions include: The University Of Calgary, Radboud University, Helen Dowlling Institute Florida State University, H.Lee Moffitt Cancer & Research Institute. Centrality index indicates significant influence by the University Of Calgary (Centrality=0.22). Inter-institutional connections are generally close with widespread regional collaborations.
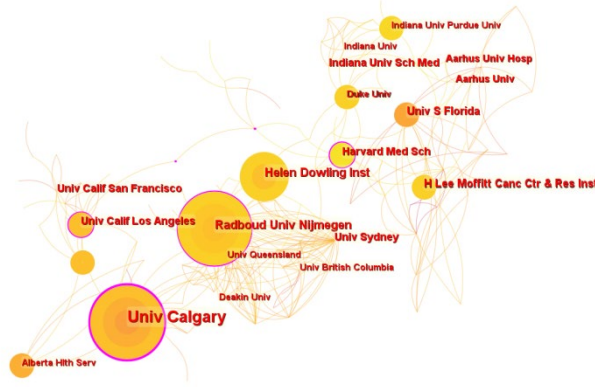
Figure 2: Co-occurrence map of research institutions of literature

3.3. Analysis of the author's cooperative network

The map of the author's cooperative network is depicted in Figure 3. The size of the nodes and fonts in the diagram corresponds to the number of articles published, while the thickness of the connection lines indicates the strength of collaborative relationships between authors [4]. In the WOS core data set, there are a total of 444 nodes and 1051 connections, resulting in a network density of 0.0103. The document map reveals extensive cooperation among authors, forming a closely-knit research group. Notably, Carlson, Linda E has authored the highest number of articles abroad, with a focus on writing 36 articles on mindfulness applications for cancer patients since their initial publication in 2000.
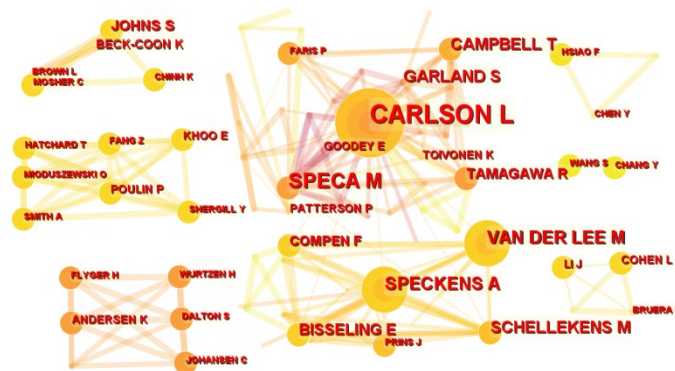

Figure 3: Author cooperation map of domestic and foreign literatures

3.4. Co-occurrence of research hotspots and keywords

The co-word atlas is a valuable tool for analyzing research hotspots and their evolution. The Q value and S value are used as the basis for evaluating the mapping effect, with Q > 0.3 indicating a significant atlas structure, and S value > 0.7 indicating high clustering feasibility [5]. Please refer to Figure 4 for the document co-occurrence spectrum, where N=406, E=3087, Density=0.0375, Q=0.3239, and S=0.7112. These values demonstrate that the generated maps have a remarkable structure and highly credible results.Excluding search words, Table 1 shows the top 10 keywords sorted by frequency.

The findings indicate that "quality of life" is the most frequently mentioned keyword. Some keywords, such as "breast cancer" (n=178, centrality of 0.10) ranking second and "health" (n=46, centrality of 0.10) ranking 16th, have both high centrality and frequency. On the other hand, some keywords like "meta analysis" (n=35, centrality of 0.12) and "follow up" (n=19, centrality of 0.16) have high centrality but low frequency. This suggests a significant number of studies on mindfulness in cancer related to meta analysis and follow-up.The appearance timeline for these keywords shows that "anxiety" first appeared in the year 2000 when Speca, M., Carlson, and Le discovered a significant reduction in anxiety among cancer patients after undergoing seven weeks of mindfulness decompression therapy [6]. The latest keywords in 2022 include "actor partner interdependence",

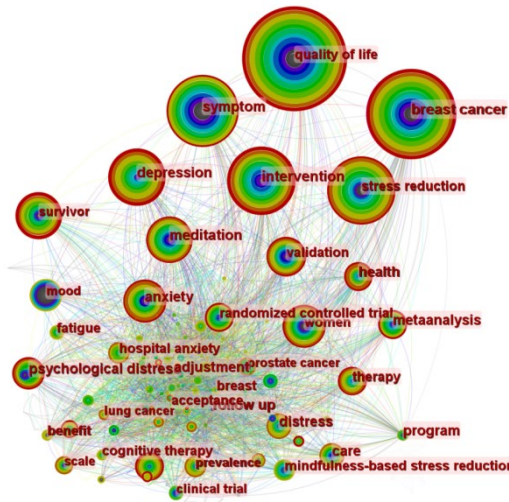"attention to treatment", and "autoregressive latent trajectory".

Figure 4: Keyword co-occurrence network of domestic and foreign literatures

Table 1: Top 10 keywords with co-occurrence frequency at home and abroad

keyword	frequency	centrality	Year of first appearance
quality of life	212	0.03	2003
Breast cancer	178	0.10	2001
Stress reduction	123	0.03	2001
depression	114	0.05	2003
Intervention	109	0.06	2004
symptom	96	0.05	2005
survivor	76	0.04	2012
meditation	73	0.09	2003
women	68	0.06	2005
anxiety	62	0.06	2000

3.5. Research Frontier Trend Change Analysis

The keyword pop-up map can be utilized to assess the evolving trend of related research frontiers and the continuity of associated research hotspots. The highlight map on the WOS platform displays 12 emerging words, as depicted in Figure 5. Within the research frontier hotspots, "mood", "symptom" and "follow up" have demonstrated persistence, lasting for 12 years, 11 years, and 10 years respectively. From an emergent strength perspective, the most prominent research topics include "mood" (strength=11.09) and "patient" (strength=6.95). The ongoing research hotspots encompass "depressive symptom" and "Disposable Mindfulne", indicating that forthcoming international research will focus on depression and mindfulness characteristics among cancer patients in the next 1-2 years.
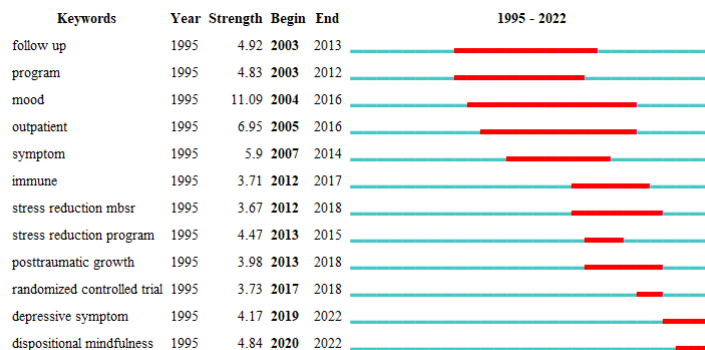

Figure 5: Emergence Atlas of Foreign Research Keywords

4. Research Status and Discussion

4.1. Research Status of Application of Mindfulness in Cancer Patients

The distribution results of domestic and foreign literature indicate a "fluctuating upward" trend in the related research on the application of mindfulness to cancer patients abroad. According to data, the standardized incidence rate of female breast cancer worldwide was 29.6/100,000 in 2015, ranking second among all cancers [7]. The increase in the number of breast cancer patients has led to increased attention from domestic academic circles towards the psychological situation of these patients since 2013, resulting in extensive research on the psychological and social problems faced by breast cancer patients treated with mindfulness. Currently, there is comprehensive and mature research on the influence of mindfulness on the psychological state and quality of life for both breast cancer patients and lung cancer patients.

Currently, various psychological issues faced by cancer patients have been thoroughly researched and examined, including fatigue, sleep quality [8], and post-traumatic growth [9]. Furthermore, different mindfulness intervention measures have been studied. Xunlin's [10] research indicates that Mindfulness-based art therapy has the most significant impact on reducing anxiety and depression in cancer patients, followed by mindfulness-based stress reduction (MBSR), with both interventions proving effective for various types of cancer. Additionally, a wide range of cancer patients have been involved in these studies, with diseases such as breast cancer and lung cancer featuring prominently in the keyword analysis. For instance, Shen Aomei [11] conducted a study on young breast cancer patients during their transition period and found that mindfulness-based rehabilitation interventions effectively reduced their perceived stress levels. Mari [12] investigated the current status of postoperative mindfulness in patients with oral and maxillofacial malignant tumors while analyzing its influencing factors. Xie Yuhong [13] utilized the mindfulness awareness scale to assess the level of mindfulness in colorectal cancer enterostomy patients.

4.2. Current Research Hotspots

Based on the clustering results and keywords, it is concluded that current research related to the application of mindfulness in cancer patients is a significant hotspot in terms of mechanism and research design.

In terms of research mechanism, "secret" and "trauma" clustering in the document clustering module are related to the study of cortisol content. The dysfunction of the hypothalamus-pituitary-adrenal (HPA) axis is associated with depression, and cortisol, one of the stress hormones affected by HPA, plays a significant role in down-regulating immune function caused by stress [14]. Carlson's study on the relationship between mindfulness-based decompression meditation program and cortisol, dehydroepiandrosterone sulfate (DHEAS), and melatonin levels in patients with early breast cancer and prostate cancer showed a significant decrease in cortisol levels over time. The eight-week mindfulness-based decompression program effectively reduced stress symptoms in these patients [15].

In terms of research design, the clustering of "randomized controlled trial", "trial", and "meta-analysis" indicates a focus on evidence-based medicine such as meta-analysis and randomized controlled research. Future exploration should include more medical evidence-based support for mindfulness intervention, increased biological evidence, and a clearer scientific understanding of the mechanisms behind mindfulness intervention.

4.3. Development Direction of Mindfulness in Cancer Research

4.3.1. Internet Plus Mindfulness Therapy

In 2022, the key focus areas include attention to treatment and continuing nursing, indicating that the application of mindfulness in cancer patients after discharge is emerging as a new research focus. According to foreign scholar Kubo, Ai [16], clinicians can utilize mobile/online mindfulness intervention as an extended measure to help improve the well-being of cancer patients and their caregivers, reduce their pain, and enhance their overall quality of life. Additionally, Lynnette Nathalie Lyzwinski [17] concluded that mindfulness intervention based on network and mobile devices has a significant impact on relieving mental stress and managing weight. Furthermore, Mak and Winnie [18] suggest that an online mindfulness training platform serves as a feasible medium for implementing and disseminating

mindfulness intervention measures for the general public.

4.3.2. Enhancing the Clinical Applicability of Mindfulness

The keyword "outpatient" in the key word pop-up map represents a research frontier issue that spanned 11 years from 2005 to 2016. According to statistics, as of 2004, more than 200 hospitals or clinics in developed countries in Europe and America, such as Britain, the United States, Germany and Canada, have established mindfulness decompression courses to teach patients mindfulness therapy. However, there is currently no unified standard for the treatment measures of mindfulness intervention.In control experiments, scholars utilized mindfulness training for durations of 6 or 8 weeks, incorporating yoga and meditation. In Shergill's research [19], patients not only underwent weekly training and exercises but also engaged in discussions on specific topics such as stress, pain, personal attitudes and values.

Furthermore, Zieil and Z [20] pointed out that cultural differences may impact the level of mindfulness. Therefore,researchers need to pay attention to exploring the organic combination of mindfulness with Buddhism.Chinese scholars combined mindfulness with TCM theory,discussing combining it with Tai Ji Chuan,and found that it can promote post-traumatic growth among breast cancer patients after surgery while reducing perceived pressure [21]. Combining mindfulness with cultural environment can enhance patients' sense of identity within mindfulness therapy and improve both its utilization rate and therapeutic effect within clinical settings.

5. Conclusion

In conclusion, mindfulness has been shown to reduce psychological issues such as anxiety and depression in cancer patients, improve their quality of sleep and life, and protect their mental health. As a result, it has garnered increasing attention from researchers. However, the research and development of mindfulness is not without its flaws, necessitating the support of scientific research platforms and wider collaboration between nursing, clinical medicine, and psychologists. In summary, the application of mindfulness in cancer patients holds great promise. Moving forward, there is potential for expansion through avenues such as the internet, mindfulness clinics, and cultural environments to explore more standardized and effective mindfulness intervention measures.

References

[1] Sung H, Ferlay J, Siegel R L, et al. Global Cancer Statistics 2020:GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries[J]. CA:a cancer journal for clinicians, 2021,71(3):209-249.
[2] Yunxia Wang, Chunlie Jiang. Biological mechanism of mindfulness meditation and physical and mental health [J]. Chinese Mental Health Journal,2016, 30(02):105-108.
[3] Ma Y, She Z , Siu A F, et al. Effectiveness of Online Mindfulness-Based Interventions on Psychological Distress and the Mediating Role of Emotion Regulation[J]. Front Psychol, 2018, 9:2090.
[4] Huizhe Zhang, Yu Lai. A CiteSpace-based Visual analysis on the research progress,focuses,and trends of medical immunology experimental teaching[J]. Chinese Journal of Immunology, 2022:1-9.
[5] Chen Yue, Chaomei Chen, Zheyuan Liu,et al. The methodology function of Cite Space mapping knowledge domains[J]. Studies in Science of Science, 2015, 33(02):242-253.
[6] Speca M, Carlson L E, Goodey E, et al. A randomized, wait-list controlled clinical trial: the effect of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients [J]. Psychosomatic medicine, 2000, 62(5):613-622.
[7] Yachong Zhang, Zhangyan Lyu, Fangfang Song, et al.Trends of incidence and mortality of breast cancer worldwide and in China[J]. Journal of Multidisciplinary Cancer Management(Electronic Version), 2021, 7(02):14-20.
[8] Jiayuan Zhang, Yuqiu Zhou, Quanzhi Zhang, et al. The effect of mindfulness-based stress reduction on Perceived stress, anxiety and depression in breast cancer patients[J]. Chinese Journal of Nursing, 2015, 50(02):189-193.
[9] Faghani Fatemeh, Choobforoushzadeh Azadeh,Sharbafchi Mohammad Reza, Poursheikhali Hanieh. Effectiveness of mindfulness-based supportive psychotherapy on posttraumatic growth, resilience, and self-compassion in cancer patients : A pilot study.[J]. Wiener klinische Wochenschrift, 2022, 134(15-16).

[10] Xunlin NG, Lau Y, Klainin-Yobas P. The effectiveness of mindfulness-based interventions among cancer patients and survivors: a systematic review and meta-analysis[J]. Support Care Cancer. 2020 Apr; 28(4):1563-1578.

[11] Aomei Shen, Wanming Qiang, Ying wang, et al. Mindfulness-based cancer recovery intervention for Young Breast cancer survivors during transitional Period[J]. Journal of Nursing Science, 2020, 35(19):95-98.

[12] Rui MA, Yan Xuan, Yao Duan, et al. Investigation on mindfulness level of patients with oral and maxillofacial malignant tumor after operation and analysis of its influencing factors[J]. Journal of Peking University (Health Sciences), 2022, 54(04):727-734.

[13] Yuhong Xie, Xiuyu Huang, Yan Lin,et al. Status and influencing factors of mindfulness in colorectal cancer patients undergoing enterostomy[J]. Chinese Journal of Modern Nursing, 2021, 27(20):2764-2770.

[14] Jingjuan Pang, Lijun Cui, YongTao Yang,et al.Controlled study of Plasma cortisol levels and inflammatory cytokines, BDNF and BDNFmRNA in depression[J]. China Journal of Health Psychology, 2022:1-11.

[15] Carlson L E,Speca M,Patel K D,et al. Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulfate (DHEAS) and melatonin in breast and prostate cancer outpatients[J]. Psychoneuroendocrinology, 2004, 29(4): 448-474.

[16] Kubo A,Kurtovich E,Mcginnis M,et al. A Randomized Controlled Trial of mHealth Mindfulness Intervention for Cancer Patients and Informal Cancer Caregivers: A Feasibility Study Within an Integrated Health Care Delivery System [J]. Integrative cancer therapies, 2019, 18: 1871069066.

[17] Lu Y Y,Lu X M,Shao C Y,et al. Empathetic nursing with mindful cognitive therapy for fatigue, depression, and negative emotions in leukemia patients undergoing long-term chemotherapy[J]. World J Clin Cases, 2022, 10(6): 1826-1833.

[18] Mak W W,Chan A T,Cheung E Y,et al. Enhancing Web-based mindfulness training for mental health promotion with the health action process approach: randomized controlled trial[J]. J Med Internet Res, 2015, 17(1): e8.

[19] Shergill Y,Rice D B,Khoo E L,et al. Mindfulness-Based Stress Reduction in Breast Cancer Survivors with Chronic Neuropathic Pain: A Randomized Controlled Trial[J]. Pain Res Manag, 2022, 2022: 4020550.

[20] Özyeşil Z. Mindfulness and psychological needs: A cross-cultural comparison [J]. İlköğretim Online, 2012, 11(1): 151-160.

[21] Zhang J Y, Li S S, Meng L N, et al. Effectiveness of a nurse-led Mindfulness-based Tai Chi Chuan (MTCC) program on Posttraumatic Growth and perceived stress and anxiety of breast cancer survivors [J]. European Journal of Psychotraumatology, 2022, 13(1): 2023314.