REVIEW

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Complementary and Alternative Treatment for the Management of Insomnia among Patients with Cancer: A Systematic Review

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Abstract

Background: Insomnia is common among cancer patients and can have significant negative health implications. Complementary and alternative therapy interventions for insomnia in this population may provide potential strategies to manage their symptoms. The purpose of this systematic review is to examine the evidence on the efficacy and feasibility of complementary and alternative therapies in cancer patients suffering from insomnia. **Methods:** A comprehensive search of electronic databases was conducted to retrieve relevant articles. Inclusion criteria were applied to the screen and select studies for the review. The included studies were critically appraised and the data were synthesized. **Results:** Eighteen studies were included in this systematic review. The studies used a variety of CATs, including aromatherapy, cognitive behavior therapy (CBT), mindfulness, relaxation techniques, and yoga. The results showed that most of these interventions improved sleep quality and symptom severity measures in cancer patients. **Conclusion:** This systematic review suggests that several CATs may be effective in managing insomnia among cancer patients. Further research is recommended to confirm these findings and to explore the potential benefits of these therapies in a broader context. Findings support the integration of CATs into supportive cancer care; however, further robust, multicenter trials are needed to address knowledge gaps and standardize practices.

Keywords: Cancer- cognitive behavior therapy- insomnia- patients- sleep quality

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Introduction

Insomnia is a prevalent sleep disorder characterized by difficulty falling asleep, staying asleep, or experiencing non-restorative sleep. It is represented by staying in bed many hours before falling asleep, waking up many times without any reason other than having difficulty returning asleep, or even sleeping a just few hours without being able to return asleep, sleeping hours vary from one person to another according to their age and condition, but in general, the adult needs from 7 to 8 hours of sleep per night [1]. It is a common problem among patients with cancer and can significantly impact their quality of life, and it occurs in approximately 30% to 50% of patients with cancer [2]. It can be caused by other problems such as pain or anxiety; it can result as a side effect from cancer treatment modalities such as chemotherapy [3].

Insomnia is a common type of sleep disorder the prevalence ranges from 10 to 15% among the general population which makes a person facing difficulty falling asleep or staying asleep [4]. Predisposing factors for insomnia in these patients are the disease itself, hospitalization, the natural anxiety over the disease, and the side effects of the most common treatment, such as chemotherapy. High percentages of patients, even up to 26.4%, were diagnosed with clinical insomnia from the beginning of their cancer and reported new onset, coexisting with other more distressing symptoms like pain, nausea, and vomiting [5]. However, it is concerning that most cancer patients do not consider insomnia a severe problem, and their health practitioners tend to focus more on other issues associated with the patient's care than treating such sleep complications [6].

Conventional treatments for insomnia, such as pharmacotherapy, may have limited efficacy or undesirable side effects in this population. Given the potential limitations of conventional cancer therapy prompt many cancer patients to seek complementary and alternative Medicine (CAM) as adjuncts or substitutes [7]. Pharmacologic agents, such as sedative-hypnotics and antidepressants, have been used traditionally in managing insomnia among cancer patients [2]. Nevertheless, some of the drugs have low effectiveness or serious side effects such as dependency, cognitive difficulties and worsening of its interaction with other therapies used in that case for cancer. Moreover, some cancer patients may be worried about the possible chronic side effects of pharmacotherapy on their general health and tend to apply use alternative

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approaches [8].

CAM refers to a broad set of healthcare practices not traditionally included in conventional medicine. These include mind-body therapies, herbal remedies, acupuncture, massage, yoga, and other exercise-based interventions. While complementary therapies are used alongside standard treatments, alternative therapies are used in place of them. For consistency, this review will use the term CAM throughout. These interventions aim to address the root causes of insomnia while supporting holistic well-being across physical, mental, and spiritual dimensions. Cancer patients often perceive CAM as more natural, holistic, and less invasive than conventional medical treatments, making it an attractive option.

Despite the widespread use of CAM interventions for managing insomnia among cancer patients, the evidence base supporting their efficacy and safety remains limited and often inconclusive. A systematic review of the existing literature is necessary to evaluate the available evidence rigorously, identify knowledge gaps, and provide clinicians and patients with an unbiased synthesis of the current research. Such a review can help inform clinical decision-making, guide future research efforts, and enhance the overall management of insomnia in patients with cancer. The purpose of the present review is to evaluate the existing evidence about the efficacy and feasibility of complementary and alternative medicine interventions for managing insomnia in cancer patients.

Materials and Methods

Eligibility criteria

The eligibility criteria of this systematic review are set according to the Cochrane Handbook for Systematic Reviews [9]. This review followed the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA statement) ensuring transparent reporting throughout [10]. Following the Cochrane Handbook methodological framework, this review aims to maintain consistency and rigor in selecting studies, extracting data, and synthesizing evidence. Using PRISMA ensures an efficient and transparent systematic review process, promoting reproducibility and increasing credibility.

Data Sources and search strategy

We conducted a comprehensive search strategy to identify relevant published studies, and the collected data were synthesized in this systematic review. The search included the following electronic databases: PubMed, Google Scholar, ScienceDirect, Wiley Online Library, Oxford Academic, SAGE Journals, and NCBI MeSH (Medline). The search period spanned from January 2010 to April 2025, allowing for a broader capture of relevant studies and improving the comprehensiveness of this review. This extended time frame ensures that earlier foundational studies and recent evidence are both included in the analysis.

To optimize the search results, a set of carefully selected keywords were employed. We used combinations of keywords and Boolean operators, including: "cancer patients" AND "chemotherapy" AND ("complementary therapies" OR "alternative therapies" OR "quality of life") AND ("aromatherapy" OR "acupuncture") AND ("insomnia" OR "sleep disorder") AND ("cognitive behavior therapy" OR "mind-body training"). These search terms were further refined to identify studies specifically focusing on self-care CAM interventions for managing sleep disturbances in cancer patients. A full list of search terms, operators, and search string examples is provided in Appendix A.

The search strategy excluded pediatric studies to ensure relevance and maintain focus on adult populations. This exclusion was based on the distinct nature of insomnia presentation and CAM responsiveness in children, which limits generalizability to adult oncology care. In addition to this, the extended search period from 2010 to 2025, combined with comprehensive search criteria, enabled a broader capture of relevant literature and a more representative analysis of CAM interventions for insomnia in adult cancer patients. This process resulted in a robust synthesis of the available evidence on the effectiveness of CAM therapies in this context.

Inclusion Criteria

1. The studies included in this systematic review are randomized controlled trials (RCTs) and quasi-experimental studies evaluating the effectiveness of using a complementary therapy in treating cancer-related insomnia among cancer patients. These designs provide a robust framework for evaluating the effectiveness of complementary therapy interventions in treating cancer-related insomnia among cancer patients.

2. Studies included in this review focused on complementary therapy used as an intervention in the treatment of insomnia. They involved patients suffering from cancer and have insomnia related to their cancer or treatment. These therapies could encompass a variety of modalities, such as acupuncture, aromatherapy, cognitive-behavioral therapy, mind-body training, or other relevant complementary approaches.

3. The target population included adult patients diagnosed with cancer and experiencing insomnia related to their cancer or its treatment. Studies involving patients from different cancer stages, types, and treatment modalities were considered.

Exclusion Criteria

1. Only studies published in English were included in this review. Studies published in other languages were excluded due to limitations in translation resources.

2. Studies focusing on children (aged <18 years) were excluded to maintain the review's focus on adult cancer patients. Pediatric patients were excluded due to differences in insomnia etiology, developmental sleep architecture, and responsiveness to CAM interventions, which limit the generalizability of findings to adult oncology populations.

3. Case studies, case series, qualitative studies, uncontrolled studies (e.g., observational studies without a control group), and controlled trials without randomization methods were excluded. These study designs may have

limitations in establishing causal relationships and generalizability of results.

Study selection and data extraction

The study selection process for this systematic review involved a thorough and systematic approach to identify relevant studies that met the predetermined inclusion and exclusion criteria. The process was conducted transparently and unbiasedly to ensure the findings' reliability and validity.

1. Study Selection

The identified articles were screened based on their titles and abstracts to assess their relevance to the research question and inclusion criteria. Studies that appeared to meet the criteria or had insufficient information were retained for full-text review. The full texts of these selected articles were then carefully evaluated to determine their eligibility for inclusion in the systematic review.

2. Data Extraction

A standardized data extraction form was developed and utilized to extract relevant information from the selected studies. The data extraction process involved systematically recording key details from each study, including study characteristics (e.g., author, publication year, study design), participant characteristics (e.g., sample size, demographics), intervention details (e.g., type of complementary therapy, duration, frequency), outcomes assessed (e.g., sleep quality, insomnia severity, quality of life), and findings related to the effectiveness of complementary therapies in managing cancer-related insomnia. Two independent reviewers conducted the data extraction process to ensure accuracy and minimize bias. Any discrepancies or disagreements were resolved through discussion and consensus. In cases where necessary information was missing or unclear, attempts were made to contact the study authors for additional clarification.

3. Quality Assessment

The quality and risk of bias of the included studies were assessed using the Cochrane Risk of Bias Tool (RoB 2) for randomized controlled trials. This tool evaluates five domains of bias: the randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result. Each domain was rated as "low risk," "some concerns," or "high risk" of bias, following the guidance provided by Cochrane.

Two independent reviewers conducted the risk of bias assessments, and disagreements were resolved through discussion and consensus. No other tools were used in this review. This evaluation ensured a consistent and structured appraisal of each study's internal validity and methodological quality, contributing to an overall assessment of the strength of the evidence.

4. Data Synthesis

The extracted data were synthesized and summarized in a structured manner. The study selection and data extraction processes were conducted with rigor and transparency, following established guidelines and protocols. By employing this systematic approach, this review aims to provide an objective and comprehensive analysis of the available evidence on the effectiveness of complementary therapies in managing cancer-related insomnia among patients with cancer.

Results

Initially, database searches found 410 articles. After removing duplicates, 327 articles remained. Their abstracts were screened for direct relevance to the aims of this systematic review. A total of 18 studies met our predefined inclusion and exclusion criteria following full-text assessment and were included in this systematic review (Figure 1). The studies are described based on the type of complementary therapy they utilized in five tables. This included 1 study on aromatherapy, 6 studies examining the effects of cognitive-behavioral therapy (CBT), four studies explored the impact of mindfulness-based interventions, one study examined relaxation techniques, and two RCTs investigated the effectiveness of yoga. all of the included studies are randomized controlled trials (RCTs), which offer a high level of evidence to assess the efficacy for these complementary therapies in treating cancer-related insomnia.

We conducted a systematic review of RCTs that will allow us to compare different complementary therapies with each other regarding the efficacy in managing insomnia among patients with cancer and provide recommendations for future studies. The psychological burden of a cancer diagnosis, combined with the stress of hospitalization and treatment, can significantly exacerbation of insomnia. Furthermore, certain medications used in cancer treatment, particularly chemotherapy agents, can directly contribute to sleep disturbances. These factors collectively contribute to the high prevalence of insomnia among patients with cancer.

Aromatherapy in the treatment of insomnia

Aromatherapy, as a complementary therapy for the treatment of insomnia, has been explored in one of the included articles within this systematic review [11]. This particular study was conducted in Turkey and focused on the use of lavender oil and tea tree oil in managing insomnia among cancer patients. The study involved a total of 70 participants who were divided into three groups: the lavender group (consisting of 30 participants), the tea tree group (comprising 20 participants), and the control group (comprising 20 participants who received regular treatment without aromatherapy).

The intervention spanned over one month, during which the participants in the lavender and tea tree groups were exposed to the respective oils each night. The primary aim of the study was to evaluate the effect of smelling lavender oil and tea tree oil on insomnia among cancer patients. The researchers assessed sleep quality as the primary outcome measure. The results indicated that patients who engaged in aromatherapy using lavender oil or tea tree oil demonstrated improved sleep quality

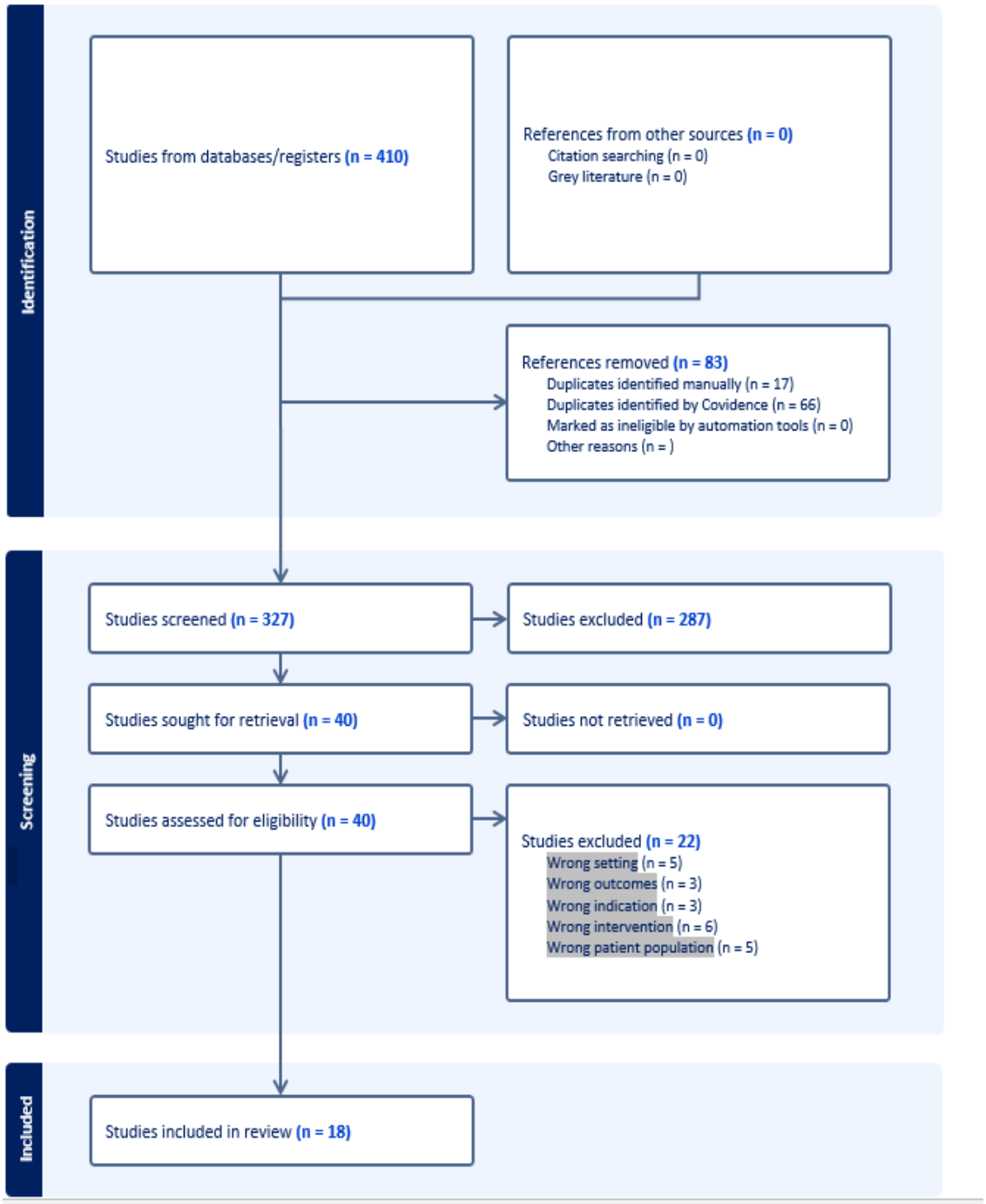

Figure 1. Complementary and Alternative Therapy for Insomnia among Patient with Cancer

compared to those in the control group who did not undergo aromatherapy.

The second study aimed to determine if the use of aromatherapy improves insomnia and other common symptoms in hospitalized patients with newly diagnosed acute leukemia. Patients were offered a choice of three scents to be used during the trial: lavender, peppermint, or chamomile. Each patient was randomized to receive either the chosen aromatherapy intervention or a placebo intervention during alternate weeks, with a washout period in between. Most patients reported poor quality sleep at baseline, but aromatherapy had a statistically significant positive impact. Improvements were noted in tiredness, drowsiness, lack of appetite, depression, anxiety, and well-being because of aromatherapy [12].

The third study evaluated the effectiveness of foot soak, lavender oil inhalation, and their combination in reducing insomnia severity in cancer patients. The F group received a 20-minute foot soak; the L group received 5-minute lavender oil inhalation; the FL group received the combination. A statistically significant reduction in insomnia severity was observed in the lavender inhalation (L) group and the combined foot soak and lavender inhalation (FL) group ($p < 0.05$). However, no significant improvement was found in the foot soak (F) group alone ($p > 0.05$). Among all interventions, the combined treatment in the FL group demonstrated the most effective results [13].

Cognitive Behavioral Therapy

Cognitive Behavioral Therapy (CBT) as an alternative therapy for insomnia was investigated in six studies included in this systematic review. All six studies followed a randomized controlled trial (RCT) design, with four conducted in the United States, one in Denmark, and one in Korea; the intervention periods in these studies ranged from 4 weeks to 8 weeks. Among the six studies, three utilized CBT as the sole intervention, while the remaining studies compared CBT with other complementary therapies such as acceptance and community therapy, acupuncture, and cheonwangbosimdan. The studies encompassed a variety of interventions and comparison groups, providing a diverse perspective on the efficacy of CBT for insomnia in cancer patients.

The findings from these studies indicated that CBT was effective in reducing the severity of insomnia and improving sleep quality in cancer patients. Additionally, when compared with acupuncture and acceptance community therapy, CBT demonstrated greater effectiveness in reducing insomnia symptoms. However, no significant difference was observed between CBT and cheonwangbosimdan in terms of their effects on insomnia.

Overall, the inclusion of these seven RCTs in this systematic review [14-20]. strengthens the evidence base supporting the effectiveness of CBT as a valuable treatment option for insomnia in the context of cancer care (Table 1).

Mindfulness and Insomnia

Table 2 displays three studies using mindfulness as a complementary therapy in treating insomnia among patients with cancer. Three studies were conducted in China. The sample size ranged from 70 to 144, and the intervention period was from 6 to 8 weeks. All of the studies found that mindfulness improved sleep patterns and reduced the severity of insomnia in cancer patients [21-24]. Other benefits were also identified across the studies, beyond sleep. Similarly, in breast cancer patients with sleep disorder symptoms there not only the guided self-help mindfulness-based intervention (MBI) had beneficial effects on insomnia but also on depression and anxiety as they are often co-occurring conditions with poor sleeping. This reinforces the point that these mindfulness techniques have a broader effects on psychological well-being.

Relaxation and insomnia

Two studies included in this review investigated relaxation as a complementary therapy for managing insomnia in cancer patients. One study involved 84 participants and evaluated the effect of Benson's Relaxation Response (BRR) over a 5-day period. Participants in the intervention group practiced BRR twice daily and demonstrated significant improvements in sleep quality, especially within 24 to 48 hours post-intervention [25].

The second study focused on breast cancer patients and examined the effects of relaxation with guided

Table 1. Cognitive Behavioral Therapy (CBT) Interventions for Insomnia in Cancer Patients

Study Title	Aim	Intervention	Sample Size	Duration	Key Findings
Feasibility and Acceptability of Brief Behavioral Therapy for Cancer-Related Insomnia	To assess the effects of brief behavioral therapy for insomnia (BBT-CI) on sleep and circadian rhythm in breast cancer patients.	BBT-CI vs. Healthy Eating Education (HEAL) control group	71 patients (34 BBT-CI, 37 control)	1 month	BBT-CI significantly reduced ISI scores compared to the control group.
Pilot Randomized Controlled Trial of a Symptom Cluster Intervention in Advanced Cancer	To evaluate a 3-session CBT-ACT intervention for insomnia, worry, depression, and fatigue.	CBT-ACT vs. waitlist control	21 patients (14 intervention, 7 control)	6 weeks	CBT-ACT improved sleep efficiency (+9%), reduced latency (-14.85 min), and decreased ISI (-2.08).
Valencia Model of Waking Hypnosis and CBT	To evaluate VMWH combined with CBT for sleep problems.	VMWH + CBT vs. education control (EC)	44 patients (22 per group)	4 sessions (1 week apart)	VMWH-CBT group showed greater improvements in sleep than EC group.
Acupuncture vs. CBT for Insomnia in Cancer Survivors	To compare effectiveness of CBT-I and acupuncture in treating insomnia.	CBT-I vs. acupuncture	160 patients (80 per group)	8 weeks	CBT-I was more effective than acupuncture in improving sleep quality.
Internet-Delivered CBT for Insomnia in Breast Cancer Survivors	To assess the efficacy of internet-delivered CBT-I.	iCBT-I vs. waitlist control	255 patients (133 per group)	6 weeks	iCBT-I significantly improved sleep quality and reduced insomnia severity.
Cheonwangbosimdan vs. CBT for Cancer-Related Insomnia	To compare a Korean herbal remedy with CBT-I for insomnia.	Cheonwangbosimdan vs. CBT-I	22 patients (randomized)	4 weeks	Both treatments reduced ISI scores; no significant difference between groups.
Randomized Trial of Two Non-Pharmacologic Interventions for Sleep-Wake Disturbances	To evaluate home-based CBT-I interventions.	CBT-I vs. control	93 patients (48 CBT, 45 control)	7 weeks	Both groups improved in sleep latency; differences were not statistically significant.

Table 2. Mindfulness-Based Interventions for Insomnia in Cancer Patients

Study Title	Aim	Intervention	Sample Size	Duration	Key Findings
A RCT of Mindfulness-Based Stress Reduction for Insomnia Secondary to Cervical Cancer	To evaluate the efficacy of mindfulness-based stress reduction on sleep parameters and hypnotic medication use.	Mindfulness-Based Stress Reduction (MBSR)	70 participants (MBSR vs. control)	8 weeks	The MBSR group showed significant ISI score reduction compared with the control group.
Guided Self-Help Mindfulness in Breast Cancer Patients: A RCT	To assess the effects of a guided self-help mindfulness intervention on depression, anxiety, and sleep symptoms.	Guided self-help mindfulness-based intervention (MBI)	144 participants (72 per group)	6 weeks	Significant improvements in sleep disorder and depression symptoms in the intervention group vs. controls.
Effects of Mindfulness-Based Cognitive Therapy in Breast Cancer Survivors with Insomnia	To investigate the effects of MBCT-I on insomnia severity in breast cancer survivors.	Mindfulness-Based Cognitive Therapy for Insomnia (MBCT-I)	136 participants (68 per group)	6 weeks	MBCT-I reduced insomnia severity significantly compared to baseline.
MBSR vs. CBT-I for Insomnia Comorbid with Cancer: A Non-Inferiority Trial	To compare the effectiveness of MBSR and CBT-I in cancer patients with insomnia.	Mindfulness-Based Stress Reduction (MBSR) vs. CBT-I	111 participants (64 MBSR, 47 CBT-I)	Post-intervention and 3-month follow-up	MBSR improved sleep and psychological outcomes, but CBT-I showed more rapid and durable results.

imagery. Sixty-five participants were randomized into an intervention and a control group. The intervention group practiced daily 20-minute guided imagery sessions at home for 7 days post-chemotherapy. The findings indicated that relaxation with guided imagery significantly reduced insomnia, anxiety, depression, and overall symptom burden compared to the control group [26] (Table 3).

Yoga and insomnia

Yoga was used as a complementary therapy in two studies in this systematic review, one in the United States and the other in India. Both used yoga as a treatment for insomnia in cancer patients, but only one compared it to a stretching program by dividing the participants into three groups, one of which was a control group. The intervention period was 6 months for one study, while for the other study, the intervention period was 1 month. Both studies show a significant difference between groups, with a better decrease in sleep distress among patients who received yoga as an intervention for insomnia among cancer patients [27, 28] (Table 4).

Table 3. Relaxation Intervention in the Treatment of the Insomnia

Study Title	Aim	Intervention	Sample Size	Treatment Duration	Key Findings
Effect of Benson's Relaxation Response on Sleep Quality and Anorexia in Cancer Patients	To investigate the effect of Benson's Relaxation Response (BRR) on sleep quality and anorexia in cancer patients undergoing chemotherapy.	Benson's Relaxation Response	84 patients (randomly divided into experimental and control groups)	Twice daily for 5 consecutive days	Significant improvement in sleep quality at 24 and 48 hours post-intervention in the experimental group.
Effect of Relaxation with Guided Imagery on Physical and Psychological Symptoms in Breast Cancer Patients	To evaluate the effect of relaxation with guided imagery on physical and psychological symptoms in patients with breast cancer undergoing chemotherapy.	Relaxation with guided imagery (20-minute daily sessions at home, delivered via CD after initial training)	65 breast cancer patients (32 intervention, 33 control)	7 days post-chemotherapy	Significant reduction in insomnia, anxiety, depression, and symptom burden in the intervention group compared to control.

Table 4. Yoga-Based Interventions for Insomnia in Cancer Patients

Study Title	Aim	Intervention	Sample Size	Treatment Duration	Key Findings
Randomized Trial of Tibetan Yoga in Patients with Breast Cancer Undergoing Chemotherapy	To examine the effects of a Tibetan yoga program (TYP) versus a stretching program and usual care on sleep and fatigue during chemotherapy.	Tibetan Yoga vs. Stretching Program vs. Usual Care	227 participants divided into three groups	Twice a week for 6 months	TYP resulted in modest short-term benefits in sleep quality, with longer-term benefits seen in those who practiced ≥2 times per week.
Effects of Mind Sound Resonance Technique (MSRT) on Sleep Quality and Psychological States	To evaluate the effects of MSRT (a yoga-based relaxation technique) on sleep quality, anxiety, and psychological outcomes in female teachers.	Mind Sound Resonance Technique (MSRT) – 30 min/day, 5 days/week	60 female teachers (30 intervention, 30 control)	1 month	Significant improvements in sleep distress scores in the yoga group compared to control (supportive counseling).

Table 5. Aromatherapy Intervention in the Treatment of the Insomnia

Study Title	Aim	Intervention	Sample Size	Duration	Key Findings
The Effect of Lavender on Anxiety and Sleep Quality in Patients Treated With Chemotherapy	To examine the effects of lavender oil aromatherapy on anxiety and sleep quality in patients undergoing chemotherapy.	Aromatherapy with lavender oil or tea tree oil applied nightly.	70 patients (30 lavender, 20 tea tree oil, 20 control)	1 month	Participants in the aromatherapy groups experienced improved sleep quality and reduced anxiety compared to controls.
The Effect of Aromatherapy on Insomnia and Other Common Symptoms Among Patients with Acute Leukemia	To determine if aromatherapy improves insomnia and other symptoms in hospitalized patients with newly diagnosed acute leukemia.	Randomized to lavender, peppermint, or chamomile scents vs. placebo. Alternating weeks with washout.	50 hospitalized leukemia patients	Not stated	Aromatherapy led to statistically significant improvements in sleep, tiredness, appetite, depression, anxiety, and overall well-being.
The Effect of a Combined Treatment of Foot Soak and Lavender Oil Inhalation Therapy on the Severity of Insomnia in Patients with Cancer	To evaluate the effectiveness of foot soak, lavender inhalation, and their combination in reducing insomnia.	F group: foot soak; L group: lavender inhalation; FL group: combination of both.	45 cancer patients (randomized to 3 groups)	14 days	Significant reduction in insomnia in the L and FL groups ($p < 0.05$); no significant change in F group alone. FL group showed the greatest improvement.

Discussion

This systematic review examined the effectiveness of various complementary and alternative medicine (CAM) interventions in managing insomnia among cancer patients. The included studies explored a range of therapies such as aromatherapy, cognitive behavioral therapy (CBT), mindfulness-based interventions, relaxation techniques, and yoga. Most of the studies reported improvements in sleep outcomes, though the degree of effectiveness varied depending on the type of intervention and study design. In this section, we interpret the findings of the reviewed studies, compare their outcomes, highlight methodological considerations, and identify gaps to be addressed in future research.

The findings suggested that the nightly inhalation of lavender oil and tea tree oil had a positive impact on the sleep quality of cancer patients experiencing insomnia. This indicates the potential benefits of aromatherapy as a complementary approach for managing sleep disturbances in this specific population. It is important to note that these studies represent a valuable contribution to the existing literature on the subject, although more research is needed to further validate the effectiveness of aromatherapy in treating insomnia among cancer patients (Table 5).

The observed effectiveness of CBT across multiple studies highlights its potential as a core intervention for insomnia in cancer patients. This superiority may be attributed to CBT's structured, goal-oriented nature and its strong theoretical foundation in psychological treatment. CBT directly targets maladaptive thoughts and behaviors that contribute to insomnia and includes practical elements such as sleep hygiene education, stimulus control, and cognitive restructuring. These components make it highly adaptable, individualized, and suitable for a range of patient needs. In contrast, interventions such as acupuncture, while beneficial for some patients, may rely on mechanisms that are less well understood, less standardized, and harder to replicate across clinical settings. The structured delivery and evidence-based framework of CBT likely contribute to its more consistent and favorable outcomes.

The collective evidence from the included trials highlight the potential benefits of utilizing CBT as a therapeutic approach for managing insomnia in cancer patients. CBT interventions have shown promise in reducing the severity of insomnia symptoms and enhancing sleep quality in this specific population. However, further research is needed to explore the long-term effects of CBT and to compare its efficacy with other complementary therapies in the management of insomnia among cancer patients.

While the results across these studies are promising, several limitations should be considered. Although all three studies were conducted in China, the cultural context may limit the generalizability of the findings to other populations. Additionally, the relatively short duration of the interventions (6–8 weeks) and limited follow-up periods raise questions about the long-term sustainability of the observed benefits. Further research is needed to evaluate the persistence of sleep and psychological improvements over time.

Moreover, the pathways by which mindfulness interventions influence sleep are not yet clearly established. A better understanding of these mechanisms could help improve the design and delivery of Just-In-Time Adaptive Interventions using mindfulness-based techniques. Another consideration is the need to compare mindfulness interventions with other non-pharmacological treatments, such as cognitive-behavioral therapy for insomnia (CBT-I), to better understand their relative therapeutic value.

The collective evidence suggest that relaxation-based interventions such as BRR and guided imagery may effectively reduce insomnia severity and enhance psychological well-being among cancer patients. The short duration of both interventions demonstrates that even brief relaxation techniques can have a positive impact. However, longer-term studies are warranted to determine the sustainability of these benefits. Future research should also explore the mechanisms underlying the observed effects and consider integrating relaxation

techniques into broader supportive care frameworks for oncology populations.

The findings from both studies suggest that yoga may be a beneficial complementary therapy for improving sleep quality in cancer patients. The longer-term intervention observed in the Tibetan Yoga study highlights that sustained practice may lead to enhanced outcomes over time. Additionally, the use of yoga-based mindfulness relaxation, such as the Mind Sound Resonance Technique (MSRT), was associated with improvements in psychological states and sleep distress. These results support the integration of yoga into supportive oncology care; however, further research is needed to explore its comparative effectiveness against other non-pharmacological interventions and its long-term sustainability.

Based on preliminary evidence of efficacy and feasibility, future research efforts should focus on CBT and mindfulness-based interventions for insomnia in cancer patients. These treatments have shown consistent effects across several randomised controlled trials on measures of sleep quality and psychological well-being. Large-scale, multi-center studies with standardized protocols and validated outcome measures are required to enhance the evidence. Future trials should also include longer follow-up periods to assess the durability of treatment effects. Additionally, comparative effectiveness research is warranted to evaluate how CBT, mindfulness, and other complementary approaches such as yoga and aromatherapy perform relative to each other in diverse patient populations and care settings. Incorporating patient preferences, cultural factors, and cost-effectiveness analyses into future study designs may also enhance clinical relevance and implementation potential.

In conclusion, Insomnia is a prevalent and burdensome problem among patients with cancer. Conventional pharmacotherapy may have limitations and side effects, leading to exploring complementary and alternative treatments as potential options for managing insomnia in this population. This systematic review aims to provide a comprehensive assessment of the current evidence on CAM interventions for insomnia in cancer patients, shedding light on their efficacy, safety, and potential integration into standard care. By critically analyzing the available literature, this review will contribute to a better understanding of the role of CAM in improving sleep outcomes and enhancing the quality of life for individuals with cancer.

Despite the impact of insomnia on the overall well-being and quality of life of patients with cancer, it is often underestimated and under-addressed in clinical settings. Healthcare providers may prioritize cancer-related symptoms, such as pain management or treatment side effects while overlooking the detrimental effects of sleep disturbances. This lack of recognition and emphasis on insomnia can result in inadequate management and missed opportunities to improve the patient's overall experience and treatment outcomes. Given the multifaceted nature of insomnia in patients with cancer and its potential impact on their physical and emotional well-being, it is crucial to increase awareness and understanding of this issue among both patients and healthcare providers. By recognizing insomnia as a significant problem and addressing it as a priority, healthcare providers can optimize the holistic care of patients with cancer, improving their quality of life and potentially enhancing treatment outcomes.

In conclusion, this study contributes to the growing body of evidence supporting the integration of complementary and alternative therapies in cancer care. Aromatherapy shows promise as a complementary treatment for insomnia among cancer patients, but further research is needed to confirm its efficacy and establish standardized protocols. Similarly, mindfulness-based interventions improve sleep quality and psychological health, suggesting that they are a valuable addition to comprehensive cancer care. However, further research is necessary to confirm these findings across diverse populations and explore long-term benefits. Additionally, relaxation techniques like Benson's Relaxation Response also demonstrate the potential to enhance sleep quality among cancer patients. Incorporating such techniques could improve the overall well-being of patients by addressing one of the most common and debilitating symptoms of cancer and its treatment. Further validation of these findings is essential, as well as exploration of the long-term benefits and mechanisms of these relaxation techniques.

Author Contribution Statement

All authors contributed equally in this study.

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References

1. Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, DonCarlos L, et al. National sleep foundation's sleep time duration recommendations: Methodology and results summary. Sleep Health. 2015;1(1):40-3. https://doi.org/10.1016/j.sleh.2014.12.010
2. Savard J, Ivers H, Savard MH, Morin CM, Caplette-Gingras A, Bouchard S, et al. Efficacy of a stepped care approach to deliver cognitive-behavioral therapy for insomnia in cancer patients: A noninferiority randomized controlled trial. Sleep. 2021;44(11). https://doi.org/10.1093/sleep/zsab166
3. Garland SN, Eriksen W, Song S, Dearing J, Barg FK, Gehrman P, et al. Factors that shape preference for acupuncture or cognitive behavioral therapy for the treatment of insomnia in cancer patients. Support Care Cancer. 2018;26(7):2407-15. https://doi.org/10.1007/s00520-018-4086-4
4. Saddichha S. Diagnosis and treatment of chronic insomnia. Ann Indian Acad Neurol. 2010;13(2):94-102. https://doi.org/10.4103/0972-2327.64628
5. Hoang HTX, Molassiotis A, Chan CW, Nguyen TH, Liep Nguyen V. New-onset insomnia among cancer patients undergoing chemotherapy: Prevalence, risk factors, and its correlation with other symptoms. Sleep Breath. 2020;24(1):241-51. https://doi.org/10.1007/s11325-019-01839-x.
6. Ge L, Guyatt G, Tian J, Pan B, Chang Y, Chen Y, et al. Insomnia and risk of mortality from all-cause, cardiovascular disease, and cancer: Systematic review and meta-analysis of

prospective cohort studies. Sleep Med Rev. 2019;48:101215. https://doi.org/10.1016/j.smrv.2019.101215.
7. Yue JL, Chang XW, Zheng JW, Shi L, Xiang YJ, Que JY, et al. Efficacy and tolerability of pharmacological treatments for insomnia in adults: A systematic review and network meta-analysis. Sleep Med Rev. 2023;68:101746. https://doi.org/10.1016/j.smrv.2023.101746.
8. Chan NY, Chan JWY, Li SX, Wing YK. Non-pharmacological approaches for management of insomnia. Neurotherapeutics. 2021;18(1):32-43. https://doi.org/10.1007/s13311-021-01029-2.
9. Cochrane. Cochrane Handbook for Systematic Reviews of Interventions." Accessed: Jul. 02, 2023. [Online. Available: https://training.cochrane.org/handbook
10. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The prisma 2020 statement: An updated guideline for reporting systematic reviews. Bmj. 2021;372:n71. https://doi.org/10.1136/bmj.n71.
11. Ozkaraman A, Dügüm Ö, Özen Yılmaz H, Usta Yesilbalkan Ö. Aromatherapy: The effect of lavender on anxiety and sleep quality in patients treated with chemotherapy. Clin J Oncol Nurs. 2018;22(2):203-10. https://doi.org/10.1188/18.Cjon.203-210.
12. Blackburn L, Achor S, Allen B, Bauchmire N, Dunnington D, Klisovic RB, et al. The effect of aromatherapy on insomnia and other common symptoms among patients with acute leukemia. Oncol Nurs Forum. 2017;44(4):E185-e93. https://doi.org/10.1188/17.Onf.E185-e193.
13. Şahin F, Özkaraman A, Irmak Kaya Z. The effect of a combined treatment of foot soak and lavender oil inhalation therapy on the severity of insomnia of patients with cancer: Randomized interventional study. Explore (NY). 2023;19(3):426-33. https://doi.org/10.1016/j.explore.2022.09.003
14. Palesh O, Scheiber C, Kesler S, Janelsins MC, Guido JJ, Heckler C, et al. Feasibility and acceptability of brief behavioral therapy for cancer-related insomnia: Effects on insomnia and circadian rhythm during chemotherapy: A phase ii randomised multicentre controlled trial. Br J Cancer. 2018;119(3):274-81. https://doi.org/10.1038/s41416-018-0154-2
15. Wells-Di Gregorio SM, Marks DR, DeCola J, Peng J, Probst D, Zaleta A, et al. Pilot randomized controlled trial of a symptom cluster intervention in advanced cancer. Psychooncology. 2019;28(1):76-84. https://doi.org/10.1002/pon.4912.
16. Mendoza ME, Capafons A. Valencia model of waking hypnosis: Background, research, and clinical applications. Am J Clin Hypn. 2018;61(2):108-24. https://doi.org/10.1080/00029157.2018.1489773.
17. Garland SN, Xie SX, DuHamel K, Bao T, Li Q, Barg FK, et al. Acupuncture versus cognitive behavioral therapy for insomnia in cancer survivors: A randomized clinical trial. J Natl Cancer Inst. 2019;111(12):1323-31. https://doi.org/10.1093/jnci/djz050.
18. Zachariae R, Amidi A, Damholdt MF, Clausen CDR, Dahlgaard J, Lord H, et al. Internet-delivered cognitive-behavioral therapy for insomnia in breast cancer survivors: A randomized controlled trial. J Natl Cancer Inst. 2018;110(8):880-7. https://doi.org/10.1093/jnci/djx293
19. Moon SY, Jerng UM, Kwon OJ, Jung SY, Lee JY, Yoon SW, et al. Comparative effectiveness of cheonwangbosimdan (tian wang bu xin dan) versus cognitive-behavioral therapy for insomnia in cancer patients: A randomized, controlled, open-label, parallel-group, pilot trial. Integr Cancer Ther. 2020;19:1534735420935643. https://doi.org/10.1177/1534735420935643.
20. Barton DL, Atherton PJ, Satele DV, Qin R, Dakhil S, Pipe T, et al. A randomized phase ii trial evaluating two non-pharmacologic interventions in cancer survivors for the treatment of sleep-wake disturbances: Ncctg n07c4 (alliance). Support Care Cancer. 2020;28(12):6085-94. https://doi.org/10.1007/s00520-020-05461-6
21. Zhang H, Li Y, Li M, Chen X. A randomized controlled trial of mindfulness-based stress reduction for insomnia secondary to cervical cancer: Sleep effects. Appl Nurs Res. 2019;48:52-7. https://doi.org/10.1016/j.apnr.2019.05.016
22. Shao D, Zhang H, Cui N, Sun J, Li J, Cao F. The efficacy and mechanisms of a guided self-help intervention based on mindfulness in patients with breast cancer: A randomized controlled trial. Cancer. 2021;127(9):1377-86. https://doi.org/10.1002/cncr.33381
23. Zhao Y, Liu JE, Lewis FM, Nie ZH, Qiu H, Han J, et al. Effects of mindfulness-based cognitive therapy on breast cancer survivors with insomnia: A randomised controlled trial. Eur J Cancer Care (Engl). 2020;29(5):e13259. https://doi.org/10.1111/ecc.13259.
24. Garland SN, Carlson LE, Stephens AJ, Antle MC, Samuels C, Campbell TS. Mindfulness-based stress reduction compared with cognitive behavioral therapy for the treatment of insomnia comorbid with cancer: A randomized, partially blinded, noninferiority trial. J Clin Oncol. 2014;32(5):449-57. https://doi.org/10.1200/jco.2012.47.7265
25. Harorani M, Davodabady F, Farahani Z, Hezave AK, Rafiei F. The effect of benson's relaxation response on sleep quality and anorexia in cancer patients undergoing chemotherapy: A randomized controlled trial. Complement Ther Med. 2020;50:102344. https://doi.org/10.1016/j.ctim.2020.102344
26. Chen SF, Wang HH, Yang HY, Chung UL. Effect of relaxation with guided imagery on the physical and psychological symptoms of breast cancer patients undergoing chemotherapy. Iran Red Crescent Med J. 2015;17(11):e31277. https://doi.org/10.5812/ircmj.31277
27. Chaoul A, Milbury K, Spelman A, Basen-Engquist K, Hall MH, Wei Q, et al. Randomized trial of tibetan yoga in patients with breast cancer undergoing chemotherapy. Cancer. 2018;124(1):36-45. https://doi.org/10.1002/cncr.30938
28. Rao M, Metri KG, Raghuram N, Hongasandra NR. Effects of mind sound resonance technique (yogic relaxation) on psychological states, sleep quality, and cognitive functions in female teachers: A randomized, controlled trial. Adv Mind Body Med. 2017;31(1):4-9.