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Effectiveness of Inhalational Peppermint Oil on Quality of Sleep: A Systematic Review

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ABSTRACT

Aromatherapy has gained popularity as a non-pharmacological treatment for sleep disturbances, and it is currently being utilized for this purpose. Aromatherapy inhalation is a generally safe and simple treatment. The study aims to assess the effectiveness of inhalational peppermint oil on sleep quality rather than undergoing a series of medications. This review article has a literature search on PubMed, Science Direct, Lilacs, Wiley online library, and Google scholar was performed using MeSH terms like Peppermint oil, sleep, and aromatherapy. Out of 207 records, 27 full-text articles were analyzed, and four articles were considered for the systematic review. This review was reported according to PRISMA guidelines. When comparing the effectiveness of inhalation of peppermint oil with other groups like lavender oil and placebo, which reveals that peppermint oil is more effective in improving sleep quality. The inhalational aromatherapy using peppermint oil is more effective in treating the quality of sleep-in patients suffering from various conditions like sleep apnea, cardiac, and cancer patients in the coronary care unit (CCU).

INTRODUCTION

Patients between the age of 25 to 45 years are the most likely to suffer from sleep disturbances. Sleep deprivation affects all cognitive processes connected to ill health, emotional management, performance, productivity, memory, and cognitive functioning.[1] Patients with cancer, heart disease, and sleep apnea have been found to have sleep disturbances. Sleep disturbances affect 44.1% of cardiac patients in the United States, 30% in Sweden, and 53% in the United Kingdom.[2,3] Cardiovascular events can be exacerbated and even worsened in patients in the coronary care unit (CCU) who are sleep deprived.

Moreover, there is no effect on tissue healing and immunity.[4,5] According to the National Cancer Institute, one-third of cancer patients have a sleep disorder.[6] Adverse effects of a sleep disorder known as sleep apnea, breathing is often interrupted.

For the treatment of sleep problems, benzodiazepines are commonly used, but they have undesirable side effects that outweigh their benefits, including dependence, tolerance, rebound anxiety, and respiratory muscle depression.[7-10] Since its introduction, aromatherapy has gained popularity as a non-pharmacological treatment for sleep disturbances, and it is currently being utilized [11] for this purpose. Aromatherapy inhalation is a generally safe and simple treatment.[12-14] It also promotes relaxation and improves physical, psychological, and emotional function.[15] On the other hand, aromatherapy has some side effects, including moderate allergic reactions, nausea, and headaches in some cases. Aromatic plants' roots, stems, leaves, and flowers are utilized in this treatment. They are also employed in other types of treatments. A popular aromatherapeutic herb is peppermint (Mentha x Piperita) from the *Lamiaceae* family,[16] a member of the mint family. Peppermint has three chemical components: menthone, menthyl acetate, and menthol.[17] Peppermint also stimulates the olfactory pathways in the hypothalamus, lowering the corticotropin-releasing hormone and the adrenal gland's release of cortisol, which reduces anxiety.[18] Because of its pleasant fragrance, peppermint oil is one of the most popular essential oils in aromatherapy treatments. It can be utilized as a herbal supplement to treat various ailments, including the common cold, headaches, vomiting, and gastrointestinal infections, among others.[19] It has been demonstrated to reduce abnormal heart rate, respiration rate, and high blood pressure.[20] Sedative properties and their effect on sleep quality have been studied in numerous research.[21] Peppermint has a stimulating impact on the brain when delivered while awake: it decreases theta activity, increases dependent negative variation amplitude, [22] and decreases the pupillary unrest index, a physiological sign of daytime

sleepiness.[23] The study aims to assess the effectiveness of inhalational peppermint oil on the quality of sleep.

MATERIALS AND METHODS

STUDY DESIGN: Systematic review of randomized controlled trials.

ELIGIBILITY CRITERIA

Inclusion Criteria

• Randomized controlled trials from 2005 onwards till the recent update.

• Full-text articles available in the search engine mentioned in the search strategy were included.

• Studies in which Peppermint oil was used as one of the ways to enhance the quality of sleep.

Exclusion Criteria

• Non-randomized studies

• Studies in which peppermint essential oil has been used for other purposes.

SEARCH STRATEGY

Published literature on assessing the effectiveness of inhalational peppermint oil on sleep quality, including original articles and research papers in databases such as PubMed, Science Direct, Lilacs, Wiley online library, and Google scholar study. A literature search to gather relevant data was performed using MeSH terms like Peppermint oil, sleep and aromatherapy using AND, OR.

SEARCH ENGINE

• PubMed

• Google Scholar

• Science Direct

• Lilacs

• Wiley Online Library

Population - Cardiac patients in CCU, cancer patients, sleep apnea patients, and young adults.

Intervention - Peppermint oil.

Comparison - With lavender oil.

Outcome - The quality of sleep is greatly improved following the aromatherapy using peppermint oil.

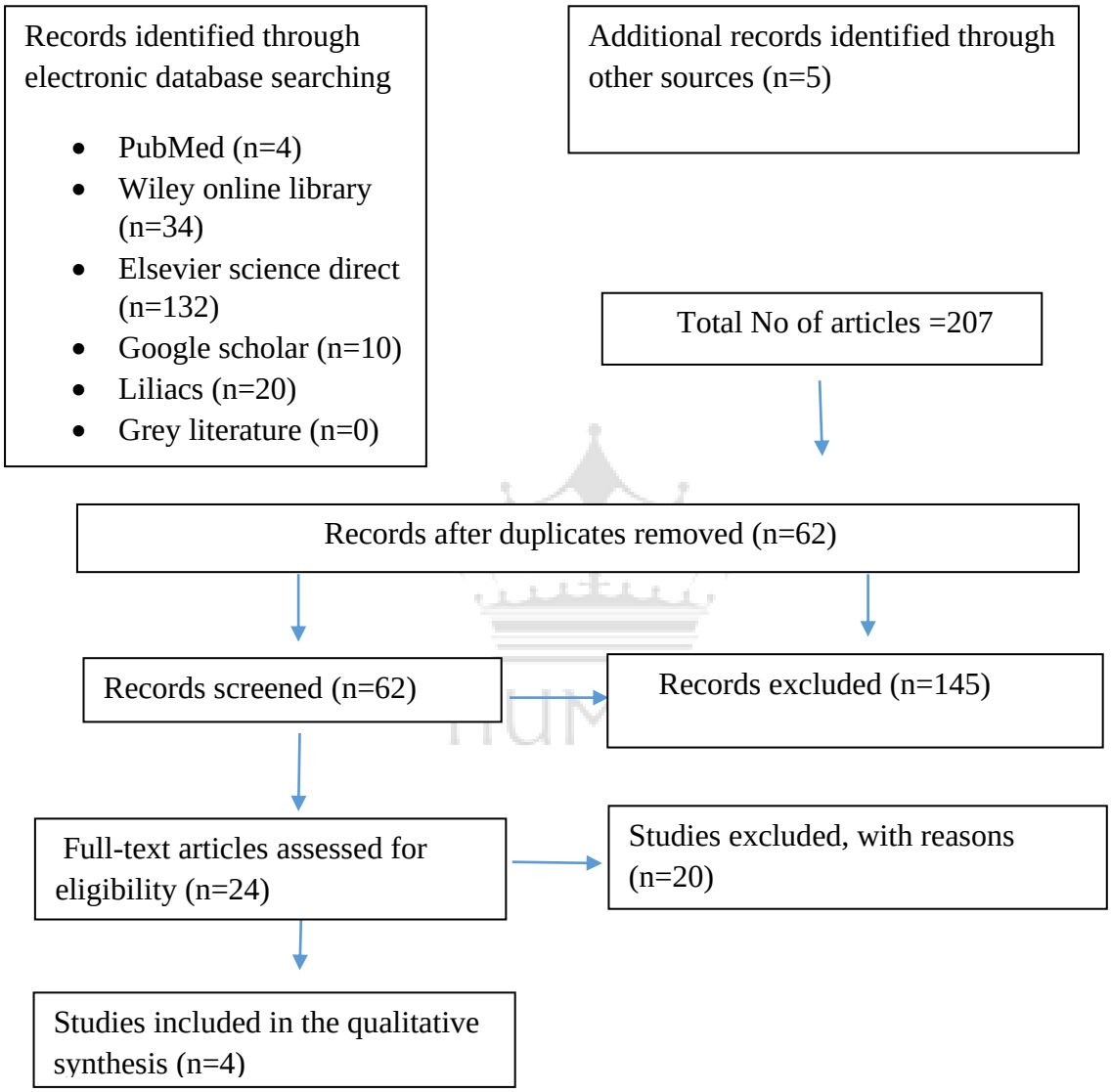

Figure No. 1: Flow diagram showing the number of studies identified, screened, assessed for eligibility, excluded, and included in the systematic review.

The search provided 207 records, out of which 27 full-text articles were analyzed, and four articles were considered for the systematic review. Figure No.1 depicts the flow chart of the reports that were found, duplicates removed, screened, excluded, and assessed for eligibility are included in the review.

RESULTS

Table No. 1: Characteristics of the interventions in the included studies

Author Name	Year	Sample Size	Patient Characteristics	Duration	Number (Case/Control)
Goel *et al* [24]	2005	21	Eleven women and ten men of the age group 18–26 years were willing to participate were taken.	Three nights	Group I - 10 individuals (6 women and four men) - received odour Group II - 11 individuals (5 women and six men) - received control
Sahar Hamzeh *et al* [25]	2019	120	Patients admitted to the cancer ward of Taleghani Hospital in Kermanshah, Iran, who were willing to participate were taken.	Seven days	Group I - (Lavender oil) - 40 individuals Group II - (Peppermint oil) - 40 individuals Group III- (Control group) - 40 individuals
Mahdavikian *et al* [26]	2020	105	Cardiac patients in CCU of Imam Ali Hospital in Kermanshah Province, Iran.	Seven nights	A block - Peppermint oil - 20 individuals B block- Lavender oil- 20 individuals C block- Control group- 20 individuals
Jayadharani *et al* [27]	2020	25	Patients who were suffering from sleep apnea.	30 days	25 individuals in the age group of (25-45) years (15males and 10females)

Table No.1 shows the characteristics of the intervention in the included studies. In all the above, the effectiveness of peppermint oil was reviewed.

Table No. 2: Outcome as reported in included studies

Author Name	Year	Effect Measure	Results
Goel *et al* [24]	2005	Subjects assessed stimulus perceptual qualities via Likert scales	Peppermint odour was rated as significantly more pleasant than water. Both men and women rated peppermint as more intense than water; this difference was greater in women than men; there was a significant session gender interaction for NREM duration ($F_{1,17} = 4.43$, $P < 0.05$); women spent significantly more time in NREM sleep during the peppermint than control session (343.87 22.41 versus 324.91 17.97; $F_{1,9} = 5.42$, $P < 0.05$; $d = 0.93$), while men showed no session differences.
Sahar Hamzeh *et al* [25]	2019	Before and after the intervention, demographic form and PSQI (Pittsburgh Sleep Quality Inventory) were completed by all three groups. Analyzed by descriptive statistics and inferential statistics. Chi-square test, independent *t*-test, and one-way analysis of variance (ANOVA) were used.	After the intervention, 90% of the subjects (n = 36) had undesirable sleep quality, and only 10% (n = 4) had desirable sleep quality in the lavender and peppermint groups, respectively. However, 95% (n = 38) of the subjects had undesirable sleep quality in the control group, and only 5% (n = 2) had desirable sleep quality.
Mahdavikian *et al* [26]	2020	Assessed using a	The mean sleep quality scores

		Sociodemographic questionnaire, a clinical information questionnaire, and PSQI.	in the control and intervention groups were 18.68 and 13.97, respectively. After the intervention, there was a significant improvement seen in the quality of sleep in both peppermint and lavender oil groups.
Jayadharani *et al* [27]	2020	Before and after using oil, inhalational were recorded using sleeping hours and sleeping disturbances.	Before the intervention of peppermint oil, the sleeping hours were 6.4±0.82, and after the intervention of peppermint oil, the sleeping hours were 7.1±1.03. Before the intervention of peppermint oil, Sleep disturbances were 3.3±1.02, and after the intervention of peppermint oil, the sleeping disturbances were 2.1±0.92. Peppermint oil has an effect on sleep disturbance, and a positive perception has been obtained from the population.

Table No. 2 shows the outcome of inhalational aromatherapy using peppermint oil on sleep quality. There was a considerable improvement in the quality of sleep at the end of the intervention period in all four studies.

Table No. 3: Bias assessment as included in the studies

Author name, Year	Random sequence generation	Allocation concealment	Blinding of outcome	Incomplete outcome data	Blinding participants and personal	Selective reporting	Judgmental bias
Goel *et al*., 2005	-	?	-	?	+	+	+
Sahar Hamzeh *et al*., 2019	+	-	+	+	+	+	_
Mahdavikian *et al*.,2020	-	+	?	+	+	-	?
Jayadharani *et al*.,2020	?	_	?	?	?	?	+

Table No.3 shows the biased assessment of the included studies. Most of the domains had a low risk of bias. + = low risk of bias; - = high risk of bias; ? = unclear risk of bias. The bias table is done in accordance with the Cochrane risk of bias tool assessment.

DISCUSSION

Peppermint oil is seen to alleviate fatigue and despair in all subjects. It was shown to be more pleasant, intense, stimulating, and elating than water. Highly intense peppermint increased SWS (slow-wave sleep), total sleep time, and sleep period time. Peppermint's stimulating effects were linked to PSG (polysomnographic) sleep. All the four included articles in the systematic review showed significant results of peppermint oil, which aimed at a better quality of sleep. [24-27] The results shown by the four studies are included.

Namini Goel *et al*., studied that, those who rated it as sedating saw a delayed commencement of SWS. Additionally, Individual differences in peppermint perception are connected with physiological changes during sleep, as demonstrated in this study. Similarly, participants who rated peppermint as stimulating experienced increased NREM (Non-rapid eye movement) and decreased REM (Rapid eye movement) sleep, whilst peppermint had gender-specific effects: it

increased NREM sleep in women but not in men and increased morning alertness in men but not in women, as compared to the control. [24]

Sahar *et al*. reported that aromatherapy with lavender and peppermint essential oils was used to compare their effects on cancer patients' sleep quality. Lavender and peppermint essential oils had the same effect on cancer patients' quality of sleep when inhaled. As a result, patients with cancer may benefit from implementing this straightforward technique to enhance their sleep quality. For two weeks, 50 people were randomly allocated to either the aromatherapy or control groups. Patients in the intervention group were given the option of either lavender, peppermint, or chamomile as the aromatherapy oil they preferred. Rosewater was utilized as a placebo. Participants spent one week in the aromatherapy group before switching to the control group for the following week. The results showed that aromatherapy improved cancer patients' sleep quality. [25]

Mahdavikian *et al*., reported the purpose of this study was to assess the effects of inhalation aromatherapy between lavender and peppermint essential oils on cardiac patients' sleep quality. The results indicated that the inhalation aromatherapy groups had significantly different sleep quality before and after the intervention. In other words, inhalation aromatherapy using peppermint and lavender essential oils may help cardiac patients sleep better. In addition, our findings indicated that aromatherapy with peppermint essential oil significantly improved sleep quality. [26]

Jayadharani *et al*., showed that before and after taking peppermint oil, sleep apnea noticed a noticeable difference. The usage of peppermint oil increased the amount of time spent sleeping. Participants with sleep apnea who were experiencing sleep disturbances saw a reduction in the number of hours they spent awake after ingesting peppermint oil. Before and after using peppermint oil, statistically significant differences in sleep duration and sleep disturbance were shown in the paired t-test. One study found that peppermint oil boosted the average number of hours of sleep for people who had previously experienced sleep deprivation by 90%. It was shown that sleep disruptions affected 80 % of people, but peppermint oil helped 60 % of those people. [27]

Reviewing all the four studies, which reveals that the inhalational peppermint oil is more effective in improving the quality of sleep when compared to other essentials oils like lavender oil.

The inhalational aromatherapy using peppermint oil is more effective in treating the quality of sleep-in patients suffering from various conditions like sleep apnea, cardiac, and cancer patients. It also shows a positive perception of the people considering aromatherapy as a treatment aid rather than undergoing a series of medications for sleep apnea. Therefore, the use of peppermint oil alleviates sleep disturbances, and it gives a good sleep quality.

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