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Does Lavender Aromatherapy or Tea Improve Quality of Sleep in Women?

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

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ABSTRACT

Objective: The objective of this selective EBM review is to determine whether or not "Does Lavender Aromatherapy or Tea Improve Quality of Sleep in Women?"

Study Design: Systematic review of three English language, primary, randomized controlled trials published between 2012 and 2015.

Data Sources: Three randomized controlled trials were obtained using PubMed and NCBI.

Outcomes Measured: The clinical outcome of sleep quality was measured in these studies via the Postpartum Sleep Quality Scale (PSQS), the Pittsburgh Sleep Quality Index and the Chinese Pittsburgh Sleep Quality Index (CPSQI).

Results: Statistical significance was determined for each randomized control trial (RCT) using p-value < 0.05. In a RCT by Chen et. al (2015), 2 weeks of intervention were used with no statistical significance found 2 weeks posttest ($p=0.460$) or 4 weeks posttest ($p=0.901$). In a RCT by Keshavarz et. al (2015), statistical significance was found when comparing the experimental and control groups after 8 weeks of intervention ($p=0.033$) and when comparing the groups pretest and 8 week follow-up results ($p=0.002$). In a RCT by Chien et. al (2012), statistical significance was found when comparing total scores before and after 12 weeks of intervention within the experimental group ($p<0.001$) but not within the control group ($p=0.776$). However, a p-value for comparison between the groups after intervention was not reported.

Conclusions: This systematic review concludes that lavender aromatherapy, not lavender tea, can be used to improve sleep quality in women. Further studies with standardized criteria and variables need to be conducted for generalizability of these results.

Keywords: Lavender, Sleep, Women

INTRODUCTION

Aromatherapy, also known as Essential Oil therapy, is the art and science of utilizing naturally extracted aromatic essences from plants to balance, harmonize, and promote the health of body, mind, and spirit.[1] Sleep is a basic human physiological need and a complex process that is essential to restoring physical agility and energy.[2] Poor sleep quality has been associated with sympathetic nervous system stress response, increased susceptibility to infection, tiredness, fatigue, daytime function problems, and depression.[2] Lavender contains active ingredients, linalyl acetate and linalool, which reduce depression and insomnia, calm the mind, and relieve anxiety.[2] This paper evaluates three randomized control trials comparing the effect of lavender aromatherapy and tea on quality of sleep in women.

Research by Milligan et al, 1997, found 95% of postpartum women experience postpartum fatigue.[2] According to the National Sleep Foundation survey in 2007, 67% of women in the postpartum period reported disturbed sleep cycle.[3] Furthermore, sleep problems are reported in 39-47% of perimenopausal women, and 35-60% of postmenopausal women from the data presented at the NIH State-of-the-Science conference on Management of Menopause-Related Symptoms.[4] In total, about 34 million Americans reach for the sleep remedy melatonin each year, spending a reported $378 million in 2014.[5] Economic predictions by Hafner et al indicated that in absolute terms, the U.S. sustains by far the highest economic losses (between $280 to $411 billion a year, which is 1.56 to 2.28 per cent of its GDP) due to insufficient sleep.[6] Furthermore, this causes the U.S. to lose an equivalent of approximately 1.23 million working days, about 9.8 million working hours, on an annual basis.[6]

The number of office visits with insomnia as the stated reason for the visit increased from 4.9 million visits in 1999 to 5.5 million visits in 2010 (13% increase), whereas the number with

any sleep disturbance ranged from 6,394,000 visits in 1999 to 8,237,000 visits in 2010 (29% increase).[7] Additionally, the number of office visits for which a diagnosis of sleep apnea was recorded increased from 1.1 million visits in 1999 to 5.8 million visits in 2010 (442% increase) and the number of office visits for which any sleep related diagnosis was recorded ranged from 3.3 million visits in 1999 to 12.1 million visits in 2010 (266% increase).[7]

It is estimated that 50 to 70 million Americans chronically suffer from a disorder of sleep and wakefulness, hindering daily functioning and adversely affecting their health and longevity.[8] The cumulative effects of sleep loss and sleep disorders represent an under-recognized public health problem and have been associated with a wide range of health consequences including an increased risk of hypertension, diabetes, obesity, depression, heart attack, and stroke.[8]
The causes of sleep loss are multifactorial but, could be divided into two major, somewhat overlapping categories: lifestyle/occupational (e.g., shift work, prolonged working hours, jet lag, irregular sleep schedules), and sleep disorders (e.g., insomnia, sleep-disordered breathing, restless leg syndrome, narcolepsy, and circadian rhythm disorders).[8] Unfortunately, available epidemiological data are not sufficient to determine the extent to which sleep loss is caused by pathology versus behavioral components.[8]

Nonmedical methods that are used to improve sleep quality include massage, exercise, yoga, acupuncture, music therapy and herbal tea.[2] Additionally, melatonin, practicing good sleep hygiene and prescription medication are also used. Sleep hygiene encompasses avoiding screen time before bed, decreasing caffeine intake, following a sleep schedule (going to bed at same time each night and waking up at the same time each morning) and avoiding napping. Insomnia prescription treatments include benzodiazepines, nonbenzodiazepine hypnotics, melatonin agonists, doxepin, suvorexant.[9] Average medical expenses of individuals with insomnia in the

United States are nearly $2,000 greater annually than those without sleep problems.[10] The number of prescriptions for any sleep medication ranged from 5.3 in 1999 to 20.8 million in 2010 (293% increase).[7] Strong increases in the percentage of office visits resulting in a prescription for nonbenzodiazepine sleep medications (~350%), benzodiazepine receptor agonists (~430%), and any sleep medication (~200%) were noted.[7]

In 2003, the World Health Organization (WHO) reported that some form of herbal medicine is used in over 50% of the population in Europe, North America and other industrialized regions and 80% of the population in Africa.[2] Lavender, when used as herbal medicine, is absorbed into the body via the skin and the olfactory system.[2] The aromatic molecules of lavender oil are detectable in the blood plasma in about 19 minutes and fall to undetectable levels within 90 minutes of application.[2] Herbal tea contains only trace amounts of aromatic molecules and, therefore, the metabolic effect of lavender tea is likely significantly shorter than lavender essential oil.[2] Since Lavender oil is believed to have minimal side effects, it has been offered in support of the analgesic and sedative properties.[2] Several biochemical constituents of essential oils, including acids, esters, coumarins, and monoterpenols, have been reported to produce hypnotic, sedative or antianxiety effects by antagonizing specified neuronal receptors or binding to other receptors and, therefore, act on nerve cell function.[2] If used improperly, these biochemicals may harm physical functions.[2] Factors that influence the safety of essential oils include quality of the essential oil being used, method of application, dosage/dilution to be applied, integrity of skin and age of client.[1]

OBJECTIVE

The objective of this selective EBM review is to determine whether or not "Does Lavender Aromatherapy or Tea Improve Quality of Sleep in Women?"

METHODS

The population of three randomized controlled trials used for this review include women aged 18 to 55 with poor sleep quality. Lavender aromatherapy, tea or a combination of both were used as interventions. Chen et al included postnatal women 25-42 years old, drinking 1 cup of lavender tea made with 2 g of dried lavender flower tea bag after inhaling its aroma nightly for 2 weeks.[2] Keshavarz et al focused on postpartum women aged 18-35 years old and used only aromatherapy with a blend of 10% lavender essential oil of sesame carrier oil nightly four times a week for 8 weeks.[3] Chien et al studied midlife women aged 45-55 years old and used only aromatherapy with 0.23 c.c. essential lavender oil and 50 c.c of water in an ultrasonic ionizer aromatherapy diffuser for 20 minutes two times per week for 12 weeks.[4] Comparison interventions used in the control groups consisted of regular postpartum care only[2], placebo sesame carrier oil[3], and participation in a health education program for sleep hygiene with no intervention[4].

The author of this systematic review used the key words “lavender”, “sleep” and “women” to find these articles via PubMed and NCBI. Inclusion criteria for selection of the three articles incorporated those published in the English language and in peer-reviewed journals, relevant to the clinical question, study outcomes mattered to patients (Patient Oriented Evidence that Matters, POEM), and qualified as randomized control trials published after 2006 with no other systematic review, meta-analysis or article in the Cochrane database answering the same question. Studies excluded were those written in languages other than English, inclusion of male participants and methods that combined lavender with other essential oils or dried leaves. A summary of statistics reported include p-value, mean changes from baseline and standard deviation. Table 1 displays demographics and characteristics of included studies.

Table 1 - Demographics & Characteristics of included studies

Study	**Type**	**# of Pts**	**Age (yrs)**	**Inclusion Criteria**	**Exclusion Criteria**	**W/D**	**Interventions**
Chen[2] (2015)	RCT	80	25-42	In post natal clinic -uncomplicated childbirth -no postnatal complication - postpartum sleep quality scale (PSQS) score >/= 16 -informed consent to participate	Having a history of allergy to any herbal tea, food or medicine	9: 4 in first 2 weeks, 5 lost at 4 week follow-up	Drinking 1 cup of lavender tea made with 2 g of dried lavender flower leaves after smelling the aroma 1 hour before bedtime for a period of 2 weeks
Keshavarz[3] (2015)	RCT	158	18-35	Post-partum women - primiparous women - uncomplicated vaginal delivery-minimum literacy tips-aged 18-35 y/o-absence of acute or chronic physical and mental illness-exclusive breast-feeders of their infants-having healthy babies without complications and sleep disorders.	Having chronic diseases (DM), using certain drugs such as hypnotics or sedatives, having a history of allergy to herbal remedies, suffering from depression.	0	4 drops of aromatherapy blend 10% lavender essential oil of sesame carrier oil dropped on a cotton ball, inhaled 10 deep breaths then placed 20 cm away from pillow until morning
Chien[4] (2012)	RCT	67	45-55	Women - 45-55 y/o – conscious, clear, available verbal communication - no symptoms of dysosmia - currently not receiving any HRT	N/A	7	0.23 c.c. essential lavender oil and 50 c.c of water in an ultrasonic ionizer aromatherapy diffuser for 20 minues, twice per week, for 12 weeks, with a total of 24 times

OUTCOMES MEASURED

All three randomized control trials measured sleep quality, but used different parameters at varying intervals. Chen et al used the Chinese version of the Postpartum Sleep Quality Scale (PSQS) with the two main categories of sleep quality as "infant night care-related daytime dysfunction" and "physical symptoms-related sleep inefficiency".[2] Fourteen items were scored on a 5 point Likert scale (0 = never, 1 = few, 2 = sometimes, 3 = often, 4 = almost always) then the scores on the three positively worded items were reversed and all items were summed.[2] Therefore, higher scores indicated poorer postpartum sleep quality.[2] Questions were designed to asses postnatal sleep quality of participants during the previous 2 weeks and the questionnaire was completed pretest, 2 week posttest and 4 week posttest.[2] Keshavarz et al used the Pittsburgh Sleep Quality Index, summed responses for all 19 questions and used the total, ranging from 0 to 21, to evaluate level of sleep quality.[3] These questions evaluated the quality of sleep in the past month and measured 7 dimentions.[3] A score of 5 or more denoted poor sleep quality and showed that the individual has some problems in 2 or more dimensions. The scale was completed by the researcher in the meetings with the mothers 3-5 days after birth, at the end of the first 4 weeks and at the end of the second four weeks after labor.[3] Lastly, Chien et all used the Chinese Pittsburgh Sleep Quality Index (CPSQI), which was completed before and after the 12 week long study.[4] A CPSQI global score of greater than 5 yielded a sensitivity of 98% and a specificity of 55% as a marker for poor sleep in primary insomniacs versus controls

RESULTS

All three articles analyzed in this systematic review used $p < 0.05$ to determine statistical significance and produced different results about the effects of lavender aromatherapy or tea on a woman's quality of sleep. Overall, both the experimental and control groups studied by Chen et

al showed no significant difference in characteristics at baseline, except education level (p = 0.015).[2] There were 80 participants, 40 in each group, who completed the pretest, 76 who completed the 2 week posttest with 38 in each group, and 71 who completed the 4 week posttest with 34 and 37 in the experimental and control groups, respectively.[2] The PSQS pretest showed statistical significance between the two groups (p = 0.014), however, there was no statistical significance with the 2 week posttest (p = 0.460) or 4 week posttest (p = 0.901).[2] These results can be reviewed in Table 2.

Table 2: Quality of Sleep Comparison Between Experimental and Control Groups[2]

	Experimental M (SD)	**Control M (SD)**	***p***
Pretest	22.53 (5.092)	25.63 (5.687)	0.014
2 week-posttest	22.89 (6.600)	26.16 (6.832)	0.460
4 week posttest	20.97 (6.735)	22.86 (6.156)	0.901

Additionally, participants of the study conducted by Chen et al answered open-ended questions and those who drank the lavender tea reported that it effectively promoted relaxation (50%), sleep quality (26.3%), and emotional stability (18.4%).[2] Although this study did not use the Pittsburgh Sleep Quality Index, significant correlation (r = 0.67) showed convergent validity and the PSQS was found to have adequate internal consistency for the participants in this study (Cronbach's α = 0.78).[2]

The participants studied by Keshavarz et al showed no statistical significance in demographic characteristics or individual-environmental confounding factors affecting sleep disorders (bedroom lighting, noise existence, tea and coffee consumption, caffeinated soft drink consumption, herbal remedies, pain complaints, etc.).[3] All 158 participants (79 women in each group) from the beginning of the study completed the 8 week follow-up.[3] Prior to intervention and at the 4 week follow-up there was no statistical significance in quality of sleep between the two groups (p = 0.64 and 0.216, respectively).[3] Conversely, there was statistical significance at

the 8 week follow-up between the two groups ($p = 0.033$).[3] Additionally, when comparing the pretest and 8 week follow-up results, statistical significance was found between the groups ($p = 0.002$).[3] Refer to Table 3 to review these results.

Table 3: Quality of Sleep Comparison Between Experimental and Control Groups[3]

	Experimental M (SD)	**Control M (SD)**	***p***
Before intervention	8.2911 (2.11922)	8.4557 (2.30272)	0.64
4 weeks after intervention	7.5949 (2.52941)	8.0633 (2.20339)	0.216
8 weeks after intervention	6.7975 (2.36632)	7.5696 (1.14646)	0.033
Pretest vs. 8 week follow-up			0.002

When comparing the control and the experimental groups studied by Chien et al, there was no statistical significance found in group demographics and characteristics.[4] At the start of the study 67 participants were recruited with 34 and 33 assigned to the experimental and control groups, respectively.[4] At the 12 week follow-up, 5 had dropped out of the experimental group and 2 had dropped out of the control group.[4] When the Mann-Whitney *U*-test was used to compare the CPSQI totals between the experimental and control groups before treatment, statistical significance was shown (-4.90 and -0.26, respectively, $p < 0.001$). Furthermore, results of changes in the CPSQI indicate that statistically significant decreases in the total score before and after treatment were observed in the experimental group ($p < 0.001$), while no significant difference was observed across the same time period for the control group ($p = 0.776$).[4] No p-value was reported comparing the experimental group and the control group after 12 weeks of intervention. An insufficient amount of data was provided for creating a table comparing quality of sleep between experimental and control groups.

DISCUSSION

Many people seek alternative treatments to treat poor sleep quality because of side effect concerns of prescription medications, especially women with nursing babies.[3] No side effects from the aforementioned interventions were reported by participants in any of the three

articles.[2,3,4] The results of the three studies conclude that lavender aromatherapy, not lavender tea, can improve the quality of sleep in women, however, there are limitations to all three RCTs.

Mode of intervention may have influenced these results. Chen et al primarily used ingestion with some inhalation, whereas, Keshavarz et al. and Chien et al used inhalation for intervention and statistical significance was found at the end of both of the later studies.[2,3,4] Since herbal tea contains only trace amounts of aromatic molecules, the metabolic effect is likely significantly shorter than that of lavender essential oil, making multiple daily consumptions necessary to achieve lasting effects.[2] This study took place in Taiwan which may have predisposed the participants to be culturally accustomed to using herbal remedies, like drinking lavender tea to promote sleep quality improvement.[2] Participants may have been drinking it prior to start of the study and women in the control group may have been drinking lavender tea, unknowingly altering the results of the study.[2]

Additional limitations to the research done by Chen at al include the following: the employed women had completed their 2-month maternity leave and returned to their regular jobs and all participants were recruited from just one medical center.[2] Returning to work could have directly or indirectly affected their quality of sleep depending on career, work related stressors and hours the participants were working. Compared to Chen et al, Keshavarz et al recruited participants from two health centers and Chien et al recruited from various communities in one city.[2,3,4]

Neither Chen et al nor Chien et al determined exclusion criteria of patients who previously used or were currently taking antidepressants, hypnotics or over-the-counter drugs.[2,4] However, Keshavarz et al did determine exclusion criteria of hypnotic and or sedative use, as well as those who suffer from depression.[3] None of the studies considered hormone levels as a

variable affecting quality of sleep in their participants. Those studied by Chen et al and Keshavarz et al were postpartum, which could have influenced the quality of sleep in these participants, especially if they were the ones waking up during the night to their newborns. Since Chien et al studied midlife women, aged 45-55, consideration of hormone levels of the participants should be monitored due to side effects of menopause on quality of sleep.

A further comparison of limitations between these studies includes duration of intervention and study. Chen et al used intervention for only 2 weeks with outcome measurements occurring at 2 weeks and 4 weeks post test.[2] Keshavarz et al used the same 8 weeks for both intervention and conducting outcome measurements of sleep quality.[3] Duration of the intervention or study may not have been long enough for Chen et al and consequently did not show statistical significance at the end of the 4 weeks.[2] This is suggested as Keshavarz et al, similarly, did not find statistical significance at the end of 4 weeks.[3] However, statistical significance was shown at the end of 8 weeks.[3] On the contrary, a strength of Chien et al is the length of intervention and study duration, 12 weeks, in which statistical significance was shown.[4]

CONCLUSION

Although the lavender aromatherapy improved sleep quality in women, lavender tea consumption did not. The studies were conducted in countries more culturally prone to drinking herbal tea (Taiwan and Iran), therefore the assumption cannot be made that this is true for all women 18-55 years old. Future studies should be conducted in various countries, including those that are not as culturally accustomed to drinking herbal tea. Additionally, the following study variables should be standardized for future studies: lavender aromatherapy administration, lavender essential oil used, length of study, current or previous use of sleep aids, depression, age, reproductive status, and hormone levels.

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