

A Systematic Review of the Effectiveness of Aromatherapy Massage on Sleep in Children and Infants

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Abstract

Background: Sleep disturbances among child patients are a commonly reported problem. We aimed to review the effectiveness of aromatherapy on sleep disorders of children and infants.

Materials and Methods: This review was conducted with a systematic search of electronic resources in English such as Medline (via PubMed), Scopus, Web of Science, Cochrane Library, and EMBASE, with no time limit from inception up to February 2019; using the following keywords alone or in combination: (Aromatherapy OR Smell OR Olfactory OR Essential oil) AND (Sleep Disorders OR Sleep OR Sleep Paralysis OR Sleep Arousal Disorders) AND (Children OR Infant OR Baby OR Neonate OR Pediatric).

Results: Four studies were included in the review. In the first study, a comparison of the nights with and without aromatherapy showed no significant difference regarding length of time the children were asleep, sleep onset time and number of interruptions during the night. In the second study, aromatherapy with Rosa damascena essential oil significantly improved sleep quality parameters in children except with daytime sleeping ($p=0.059$). In the third study, a significant decrease was observed in the sleep quality score in children with acute lymphoblastic leukemia in aromatherapy with oil of orange than in the controls ($p<0.05$). In the fourth study, the infants in the Lavender bath oil group spend more time in deep sleep and less time crying prior to sleep onset than in the control group ($p<0.05$).

Conclusion: Aromatherapy with Lavender and Rosa damascena essential oil and orange oil can improve group sleep quality, deep sleep and time crying prior to sleep onset. However, it was not effective regarding sleep disorder in children with autism.

Key Words: Aromatherapy, Children, Infant, Massage, Sleep.

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1- INTRODUCTION

Sleep is a basic physiological process (1, 2), and is essential to life (3) in which the body reproduces its energy and leads to hormone secretion, protein synthesis and cellular differentiation required for functional growth and development. Children's growth is highly affected by sleep, physically, mentally, emotionally and in cognitive function. Sleep disorders are also associated with educational skills and attention deficit disorder (4, 5). Children's sleep disorders are identifiable by excessive decrease or increment of sleep in accordance with age, abnormal sleep patterns, abnormal sleep behaviors or the occurrence of pathophysiological events during sleep (6). Sleep disorders, the most prevalent behavioral problem amongst children, are clinically diagnosed, however, in some cases specialized studies and a sleep lab may be required.

Drug therapy is one of the common interventions curbing sleep disorder in spite of its side effects such as addiction, drug dependency, drug resistance and memory impairment. Regarding the side effects and high-cost of the drugs burden on the treatment systems, there are more efficient and less risky therapies that can be used to enhance the sleep quality in patients (7). The use of complementary and alternative therapies as low-risk, cost-effective, easy, and with limited side effects in nursing care is expanding in many health care centers. Aromatherapy as one of the complementary therapies is a holistic treatment relieving the burdens and stresses on the nurses (6). Aromatherapy is a pseudoscience based on the usage of aromatic materials, including essential oils, and other aroma compounds, with claims for improving psychological or physical well-being (8). It is offered as a complementary therapy or as a form of alternative medicine, the first meaning alongside standard treatments

(9), the second instead of conventional, evidence-based treatments (10). The use of essential oils for therapeutic, spiritual, hygienic and ritualistic purposes goes back to ancient civilizations including the Chinese, Indians, Egyptians, Greeks, and Romans who used them in cosmetics, perfumes and drugs (11). The use of volatile oils or aromas extracted from aromatic plants for therapeutic purposes is referred to as "aromatherapy" which can be used as part of an integrated multidisciplinary event to optimize outcomes for children with different health challenges (6). With respect to the literature, there is no systematic review for the effect of aromatherapy on sleep disorders. The aim of this study was to review the effectiveness of aromatherapy on sleep disorders of children and infants.

2- MATERIALS AND METHODS

2-1. Study design

Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) checklist was used as a template for this review. Systematic searches were performed on Medline (via PubMed), Web of Science, EMBASE, Cochrane and Scopus, to find clinical trials investigating systemic aromatherapy effects on sleep in children and infants, without any time or language constraints, using the following keywords in combination (Aromatherapy OR Smell OR Olfactory) AND (Sleep Disorders OR Sleep OR Sleep Paralysis OR Sleep Arousal Disorders) AND (Children OR Infant OR Baby OR Neonate OR Pediatric).

2-2. Eligibility criteria

Participants, interventions, comparators, and outcomes (PICO) was used to formulate the review objective and inclusion criteria (12).

Participant: Infants and Children up to 18 years old. **Interventions:** Any type of aromatherapy as the primary treatment, and other aroma treatment modalities. **Comparators:** Treatment vs. control group, treatment vs. different type of treatment, before vs. after treatment. **Outcome:** Primary outcome: reduction of sleep quality, secondary outcomes: significant changes in other sleep parameters (sleep durations, resistance to sleep, fatigue during day, crying prior to sleep, etc.).

2-3. Inclusion and exclusion criteria

We included all Randomized controlled trials (RCT), clinical studies both randomized and nonrandomized retrospective or prospective assessed aromatherapy effects on sleep disorders in children and infants. Studies published in English up to Feb 2019. Studies that include adults in its sample, studies that evaluate the use of other modalities in the treatment of sleep disorders in children, and studies including a specific sample group; children with syndromes or systemic disorders were excluded. We also excluded other studies such as abstracts presented at conferences, review articles, letter to editors, letters, pilot, and case reports.

2-4. Study selection

A database search was done for possible studies, abstracts of the studies were screened for identification of eligible

studies, full text articles were obtained and assessed and a final list of included studies was made. Two reviewers did this process independently and in duplication and a third reviewer resolved any discrepancy.

2-5. Data collection process

PRISMA flow diagram was used to show the process of study selection (**Figure.1**). For each included article (6, 12-15), the following data was extracted and recorded in a table including Subject, study design, year, country, intervention applied, drop out, assessment tool, adverse effects, and aromatherapy type, etc. (**Table.1**). Two reviewers collected the data independently, collected data was combined and compared for accuracy, and a third reviewer resolved any discrepancies (*Please see the table.1 in the end of paper*).

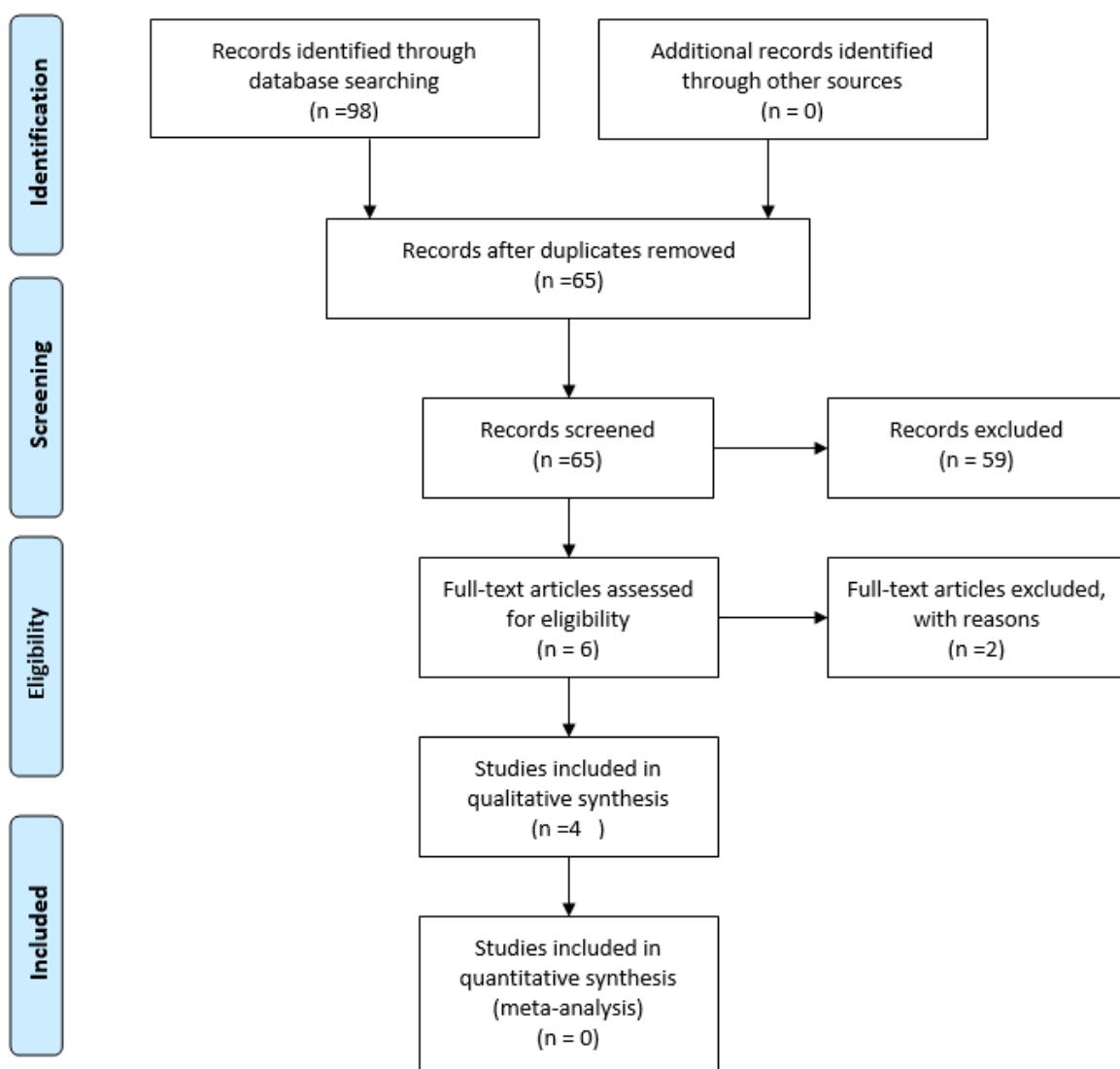
2-6. Quality assessment of included studies

Two reviewers carried out the quality assessment of the articles independently and in duplication, the third reviewer resolved any discrepancies. The assessment of quality in the included studies was carried out following the Jadad scale (16), consisting of three criteria of randomization, blinding, and reporting of dropout or withdrawal and reasons in order to score the articles. The total score on this scale is between 3 and 5 points (**Table.2**).

Table-2: Quality Assessment using Jadad scale (16).

Authors, Reference	Randomization			Blinding			Report of dropping out
	Mention randomization	Appropriate method	Inappropriate Method	Mention blinding	Appropriate method	Inappropriate method	
Alijani ranani et al., (6)	😊	😊	😢	😢	😊	😢	😢
Williams, (13)	😐	😢	😢	😊	😊	😢	😊
Keyhanmehr et al., (14)	😢	😊	😢	😊	😊	😢	😊
Field et al., (15)	😊	😊	😢	😢	😊	😢	😢

😊: Yes; 😢 : No; 😐 : Unclear.

**Fig.1:** PRISMA flowchart of present study

3- RESULTS

Four studies (with 132 individuals) were included in the systematic review. PRISMA flow diagram was used to show the process of study selection (**Figure.1**). Three studies included children (6, 13, 14), and one study included infants (14). In the first study, comparison of the night sleeps in children with and without aromatherapy showed no significant difference regarding the length of time the children were asleep ($p=0.89$), sleep onset time ($p=0.30$), and number of interruptions during the night ($p=0.21$); however, sleep durations showed a significant difference ($p<0.001$) when the

night sleeps with aromatherapy were compared with night sleeps without aromatherapy (13). In the second study, in a before and after study without control group, aromatherapy massage with Rosa damascena essential oil significantly ($p=0.03$) improved all sleep qualities, such as resistance to sleep, difficulty waking in the morning, nightmare and waking-up during the night in children except daytime sleeping ($p=0.059$), and fatigue during the day (14). In the third study, a significant decrease ($p<0.001$) was observed in sleep quality score in children with acute lymphoblastic leukemia in the aromatherapy massage with oil of orange

group than the control group (6). In the fourth study, the infants in the aroma bath oil group spend more time in deep sleep and less time crying prior to sleep onset than the non-aroma bath oil group (15).

4- DISCUSSION

Aromatherapy is defined as aromatic healing scents, a combination of art and knowledge having impact on the body, mind and soul, alleviating stress and therefore, providing an efficient experience of relaxation. Aromatherapy exerts its effect by absorption through either the skin or the olfactory system to the central nervous system (17). Sleep disorders are a common side effect of clinical treatment of children with leukemia (18). Nowadays, complementary and alternative therapies in pediatric medicine, especially aromatherapy massage, are used for a wide range of disorders such as epilepsy, headaches, brain injuries, musculoskeletal disorders, developmental delays and many neurological disorders in children; its use feedback has been considered, but it still requires more extensive research to provide a chance for effective and selective therapies to explain discrepancies between the existing techniques (19).

Childhood autism disorder encompasses a broad range of behavioral disorders, such as in communication and social skills. One of the common problems these children face is sleep disorder, for which, according to a meta-analysis, no effective results were indicated by complementary, drug, or behavioral therapies (13). The current study has not identified points of note on the effectiveness of aromatherapy, (compared to other studies), on sleep disorders in children suffering from autism. According to the researches, developmental defects observed in the gamma system of the cerebral cortex, due to impaired synthesis of neurotransmitters

such as serotonin, dopamine and norepinephrine, play an important role in autism and insomnia. Moreover, abnormalities in the pathway of melatonin synthesis in autistic patients have been addressed due to the sedative effects of this hormone. Sleep disorders in children are very problematic since they also affect the quality of parents' sleep. However, the emphasis on complementary therapies along with medications such as risperidone, mirtazapine and melatonin is still considered, as there is still little evidence of how complementary therapies may be effective in treating insomnia disorders in children with autism (20, 21). That may justify the difference between the present study and the other three studies. The study conducted on autistic children on the basis of comparing nights with and without aromatherapy, showed no significant difference in the length of time children were asleep, sleep onset time and number of interruptions during the night. Nevertheless, sleep durations showed a significant difference compared to the nights lacking aromatherapy (13).

In contrast to the other three studies, aromatherapy was not effective at rectifying sleep problems in the autistic infants. Another approach in the field of complementary medicine has been known as aromatherapy promoting relaxation of the person by affecting the limbic part of the brain. Lavender aroma, one of these fragrances, has been reported to have anxiolytic and sedative properties (17). Lavender aroma is scientifically named *Lavandula angustifolia* belonging to the mint family. Effective ingredients in combination are Linalone and Linalyl Acetate, which act in a sedative role on the central nervous system through the utilization of gamma-butyric acid. Studies have suggested that lavender aromatherapy improves sleep quality and its essence shortens the time to fall asleep, increases the second stage of sleep, and reduces

rapid eye movement. Lavender has a relaxation role on the central nervous system, with its active ingredients such as linalone and linalyl acetate acting on the gamma butyric acid receptor (6). Two studies evaluated the effectiveness of aromatherapy on sleep quality. In the first study, aromatherapy with Rosa damascena essential oil significantly improved all sleep quality parameters such as sleep resistance, difficulty waking up in the morning, nightmare and waking up during the night in children except daytime sleep ($p= 0.059$), and fatigue during the day (14). In the second study, a significant decrease ($p<0.001$) was observed in the sleep quality score in children with acute lymphoblastic leukemia in aromatherapy massage with oil of orange group than in the control group (6). Aromas of Mohammadi flowers are one of the most commonly used essential oils in aromatherapy. Since they contain linalool components, they produce sedative feelings by affecting the gamma-butyric acid and the central nervous receptors (17).

Another common essential oil in citrus-like aromatherapy is orange oil. Orange trees grow in different parts of Northern and Southern Iran and are medicinal for the treatment of colds, liver disorders, gall bladder problems, rheumatoid arthritis, gastrointestinal disorders, skin patches have been used in some clinical studies to assess the anxiolytic and insomnia effects (inhalation of this essential oil and no serious adverse events have been reported so far) (6). Plants that affect the quality of sleep by stimulating the parasympathetic system exert their sedative effect. According to the review of current studies, inhalation of orange essential oil has also been effective in treating sleep disorders in children with acute lymphoblastic leukemia without any side effects (6). In the second study, a significant decrease in sleep quality score was observed in children with acute lymphoblastic

leukemia who were under aromatherapy treatment with orange oil rather than the control group (6). In the fourth study, infants in the aroma oil bath- group spend more time in deep sleep and less time crying prior to sleep than the non-aroma bath oil group (15).

4-1. Study Limitations and strengths

Lavender contains phytoestrogen. Phytoestrogens are classified into four groups, isoflavones, stilbene, coumestan, and lignan. It is suggested that follow-up studies to investigate the effect of other phytoestrogen compounds in these four groups on these disorders may help to effectively understand mycotoxin. Given quality of the methodology, it is suggested that follow-up studies be designed and reported based on censorship. These deficiencies included missing or inappropriate random allocation sequences, missing or inappropriate blindness reports, and the lack of suggestion. This study had other limitations. A low number of studies and their low sample sizes indicated the requirement for further studies with larger sample sizes. Some studies with low sample sizes may change their results if the sample sizes were to be increased. Some published studies were excluded from this study because of a lack of a placebo group. Another limitation of this study was that, none of the studies reported side effects due to the lack of side effects. The strength point of this study is that it is the first systematic review and has a low sample drop. Most studies in Iran modified to generalize the study findings difficult.

5- CONCLUSIONS

Inhalation with aroma oil (such as with Lavender and Rosa damascena essential oil and orange oil) can improve group sleep quality, deep sleep and less crying time prior to sleep onset. However, it was not effective in relation to sleep disorder in

children with autism. This method of treatment can be used as a useful method of treatment but the findings of these studies should be interpreted with caution due to the high heterogeneity between the studies, the small number of studies and small sample sizes.

6- CONFLICT OF INTEREST: None.

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Table-1: Queri Some clinical and baseline characteristics of four studies included in systematic review.

Study, Year, Country, Reference	Study design	Aromatherapy type	Outcomes	Subjects	Intervention	Control	Drop out	Assessment toll	Results	Adverse effects
Alijani ranani et al., 2014, Iran, (6)	A quasi-experimental study	Orange essence	Sleep quality	60/60	Intervention included inhaling essential oil of orange, three days a week, three times daily.	Sterile water	-	Children's Sleep Habits Questionnaire	Significant decrease was observed in sleep quality score in children with acute lymphoblastic leukemia in aromatherapy with oil of orange than control Conclusion($p<0.001$).	-
Williams, 2006, UK, (13)	Pilot study	Lavender oil	Sleep onset, sleep duration and waking up at night	12	Aromatherapy as a foot and leg massage using 2% lavender oil in grapeseed oil on three separate evenings during the study period at the school. The timing of each child's aromatherapy was variable owing to other activities undertaken by the child, but was always in the last 2 h before going to bed.	-	8.3	Research made questionnaire	Comparison of the nights showed no significant difference regarding length of time the children were asleep ($p = 0.89$), sleep onset time ($p = 0.30$) and number of interruptions during the nights ($p=0.21$) However, sleep durations ($p < 0.001$) showed a significant difference ($p < 0.001$) when the nights with aromatherapy were compared with nights without aromatherapy.	-
Keyhanmehr et al. 2018, Iran, (14)	Experimental before and after study	Rosa damascena	Sleep Quality	30/30	Children inhaled 5 drops of Rosa damascena essential oil on a cotton ball before sleep for 20 min (2 weeks).	-	-	BEARS questionnaire	Aromatherapy with Rosa damascena essential oil significantly improved all sleep quality like resistance to sleep, difficulty waking in the morning, nightmare and waking up during the night in children except daytime sleeping ($p=0.059$) and fatigue during day ($p=0.03$).	-
Field et al., 2008 USA, (15)	RCT	Lavender bath oil	Sleep behavior	10/20	The bath was then prepared by the research assistant, and the mother placed the infant in the bathtub with either the scented or the unscented bath oil.	Non-aroma bath oil group	-	At that moment, the video camera focused on the infant, and the 20 min sleep recording began.	The infants in aroma bath oil group spend more time in deep sleep and less time crying prior to sleep onset than non-aroma bath oil group.	-

RCT: Randomized control trial