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Natural Sleep : The Role of Essential Oils

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Introduction:

The terms "therapy" (meaning treatment) and "aroma," which implies fragrance or scent, are the roots of the term "aromatherapy." One can naturally heal their mind, body, and spirit with this therapy [1].

According to the National Association for Holistic Aromatherapy (NAHA), aromatherapy is "the art" and "science" of using naturally occurring plant extracts of fragrant essences to support, balance, and harmonize a healthy body, mind, and spirit. (2).

Adults who use aromatherapy have less stress and better sleep. The following essential oils can be utilized in aromatherapy: rose, lavender, eucalyptus, lemon, and chamomile. Aromatherapy is administered by breathing, rubbing, and bathing in essential oils. Due to its quick turnaround time, ease of usage, and lack of specialized equipment, aromatherapy is thought to be more successful in treatment (3).

One of our primary necessities is sleep (4). Sleep is an essential process that promotes stability, rest, and the preservation of mental and physical health (5). Chronic conditions such diabetes mellitus, hypertension, cardiovascular disease, and obesity are frequently associated with sleep disturbances, also referred to as insomnia (6).

Background: More than 10% of Americans suffer from chronic insomnia, and up to 33% of adults in primary care settings—where it most frequently manifests for initial diagnosis and treatment—are affected by this extremely common disorder (7,8). Chronic sleeplessness has been associated with worsening of coexisting medical illnesses, a lower quality of life, and a higher risk of mental and drug use disorders (9, 10, 11). Additionally, estimates show that the annual healthcare costs for persons with untreated insomnia are more than $1,200 greater than those for adults without insomnia (12). As a result, persistent insomnia has a significant negative impact on both individuals and

society. First-line therapies for chronic insomnia include cognitive-behavioral therapy and hypnotic drugs, especially benzodiazepine receptor agonists [13]. Each medication has important drawbacks, even though numerous randomized controlled trials have shown it to be effective. For instance, although hypnotics are widely accessible and simple to use, there is little information on their safety and effectiveness when used over an extended period of time; tolerance and reliance may develop, and many patients choose non-pharmacological treatments for insomnia. However, individuals with chronic insomnia have limited access to cognitive behavioral treatment, which is beneficial for both short-term and long-term insomnia with minimal obvious adverse effects.

Alternative Therapies for Insomnia:

Between 10% and 30% of people worldwide suffer from insomnia. Because they are non-invasive and non-pharmacological, alternative therapies like aromatherapy are becoming more and more well-liked.

Definition of Insomnia:

Both nocturnal and diurnal symptoms are hallmarks of insomnia. It is characterized by difficulties falling asleep at nightfall, frequent or lengthy awakenings, or early morning awakenings with difficulty falling back asleep. The main complaint is that of not being satisfied with the quality or length of sleep. [14, 15].

Insomnia symptoms:

1. Age of onset, precipitating event (or events) and sudden or gradual onset.
2. Current symptoms including difficulty getting to sleep, problems staying asleep and waking up too early.
3. Frequency of symptoms: either every night, episodic, specific nights, situation-specific or seasonal variation.
4. Course since onset of symptoms, such as change in severity over time or relative emergence of symptoms (if more than one).
5. Perceived daytime consequences [16, 17]

How aromatherapy works:

Essential oils have been valued for ages as a scent that has therapeutic properties for the body, mind, and soul. These scent molecules are powerful organic plant compounds that rid the environment of bacteria, viruses, fungi, and disease [18, 19]. Numerous scientists have well documented their multifaceted properties, which include antibacterial, antiviral, and anti-inflammatory properties, as well as an immune-boosting body with relaxing, hormonal, glandular, emotional, circulatory, and memory and alertness-enhancing effects [20, 21]. To understand the nature and role of human disease and disorder, numerous pilot projects and studies have been carried out [22].These oils are known for their energy-specific properties, as their strength does not diminish with age. These oils' stimulating capabilities are based on their structure, which is quite similar to genuine hormones [23].

Mechanism of action of essential oil in aromatherapy:

Increased neurogenesis, regulation of hormonal levels, selective stimulation of certain brain regions, and alteration in blood biochemistry affecting both mood and emotions are the few outcomes that could be triggered by the potential use of essential oils (Timothy K.H. Fung et al., 2021). Such favourable outcomes result from inhaling the volatile elements constituted within such oils. When inhaled, the mechanisms through which they act typically consist of two pathways-the olfactory stimulation and the respiratory stimulation. Inhalation aromatherapy via olfactory stimulation principally works through the activation of the olfactory nerve extending from the nose toward the brain. The therapeutic stimulation that these oils offer is vastly due to their close structural resemblance with the physiological neurotransmitters and hormones. Such close structural chemistry enables the stimulation of olfactory chemoreceptors lining the nasal passage and thus activates the olfactory signaling as depicted in Fig. 2b. This signaling terminates in the higher cerebral cortex following which the olfactory sensory neurons convey electrical impulses to the limbic and hypothalamic regions of the brain through the olfactory bulb and upper olfactory cortex (Sattayakhom et al., 2023). Some highly volatile molecules can directly enter the brain and regulate the neuronal pathways upon inhalation and can bypass the entire olfactory signaling. Either way, the end physiological result is a surge of neurotransmitters and neuromodulators, causing an overwhelming sense of calmness in the mind and body, thus alleviating symptoms of anxiety and depression. The topical application of essential oils mainly works through skin penetration by dissolving with the skin's cell membrane lipid constituent. The chemical composition of essential oil will determine the depth of penetrability of oils into the skin e.g., jojoba, avocado, soybean, almond, etc. are limited to the upper epidermis while oxygenated terpenes can penetrate deeper layers and through the skin (de Andrade et al., 2021). Some oils are also used as penetration enhancers both internally and topically depending on different mechanisms like enhancing drug partitioning, disintegrating highly ordered intercellular (between corneocytes in stratum corneum) lipid structure, and inducing conformational modification by interacting with intercellular protein domain (Herman and Herman, 2015). Essential oils ideally contain a plethora of volatile compounds whose therapeutic importance is of great value. The molecular sizes of the essential oil molecules will determine their delivery to the brain through different routes. The inhalation rate and success of delivery increases as the size of the formulation decreases. The disadvantage of inhalational therapy is the improper penetration of these molecules into the brain due to their non-uniform varying sizes. But through the use of nanotechnology, the employment of encapsulated nanoparticles has yielded better absorption results of these essential oils making it a promising therapeutic future venture (Fung et al., 2021).(24)

Classification of aromatherapy:

1. Cosmetic aromatherapy:

This treatment uses specific essential oils for cosmetics for the face, body, skin, and hair. These products are used for a variety of purposes, including toning, drying, moisturizing, and cleansing. Essential oils can be used in face products to achieve healthy skin. Cosmetic aromatherapy in the form of a foot or full body bath will be an easy and efficient method to experience it on a personal level. Likewise, a few drops of the right oil provide a renewing and rejuvenating effect [25].

2. Massage aromatherapy

The use of grape seed, almond, or jojoba oil with pure vegetable oil for massage has been proved to have great results. This is often referred to as the healing touch in massage therapy [26, 27].

3. Psycho-aromatherapy

In psycho-aromatherapy, these oils can induce specific moods and feelings, providing the pleasure of rest, invigoration, or a happy recollection. In this therapy, the oils are inhaled directly through an infusion in the patient's room. Psycho-aromatherapy and aromacology are both concerned with the research and effects of aroma, whether natural or synthetic. Psycho-aromatherapy has been limited to the investigation of natural essential oils [28].

4. Medical aromatherapy

René-Maurice Gattefosse, the pioneer of modern aromatherapy, used essential oils to massage patients during surgery, applying medical aromatherapy knowledge of essential oils' effects on promoting and treating clinically identified medical conditions [29].

5.Olfactory aromatherapy

Inhaling essential oils has given rise to olfactory aromatherapy, in which simple inhalation has resulted in increased emotional wellbeing, calmness, relaxation, or renewal of the human body. The discharge of stress is combined with enjoyable scents that trigger odor memories. Essential oils supplement medical treatment and should never be used as a substitute [30, 31, 32].

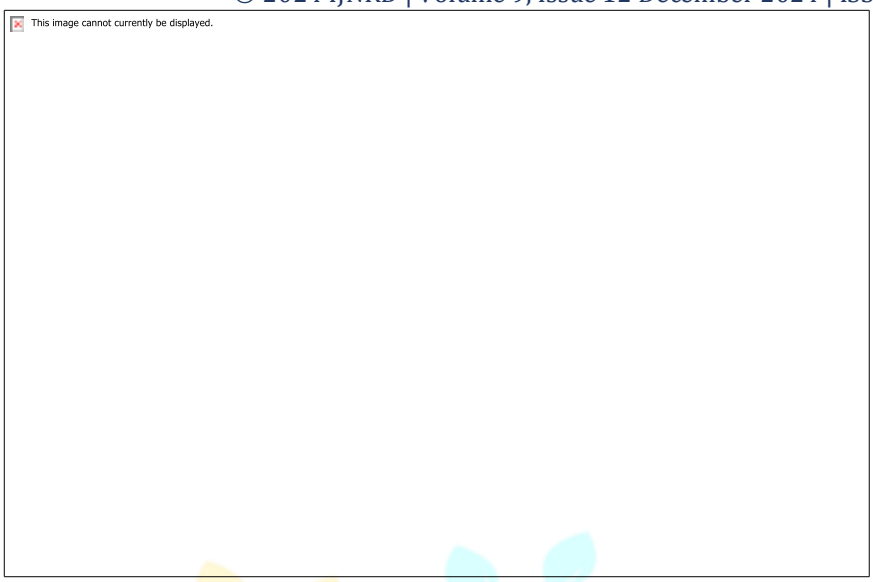

Figure No.1 Classification of Aromatherapy

1.Factors that influence Insomnia symptoms:

a) Past and current treatments including their efficacy.

b) Factors that improve or ameliorate symptoms.

c) Factors that exacerbate insomnia, such as stress or schedule changes.

d) Factors that maintain insomnia including behavioral factors, for example going to bed too early, getting extra sleep on the weekends and drinking alcohol, and cognitive, for instance unhelpful beliefs about sleep, worry about the consequences of insomnia and fear of poor sleep.

A) Health

a) Medical disorders and symptoms, including co-morbid sleep disorders

b) Pain, discomfort and treatments that interfere with sleep

c)Pharmacological considerations including alerting and sedating effects of medications

B) Social

e) Work schedule that is incompatible with sleep

f) Arriving home late without enough time to wind-down

g) Family and social responsibilities at night, such as caretaking of a child (or children) or an elderly person

h) Stressful life events: past stressful events might be precipitants and current stressful events might be perpetuators

i) Sleeping with pets. [16,17]

What are Essential Oils:

Essential oils do not appear to be "oil" in the traditional sense. To have a better understanding of essential oils, let's first look at another more prevalent oil family known as "fixed oils." Fixed oils are non-volatile (i.e., they do not evaporate into the air) animal or plant oils; these are the ones we are all familiar with and frequently use in the kitchen. Essential oils, often known as "volatile oils," vary from other oils in that they evaporate quickly and enter the body through the skin. The oil's volatile nature is what makes it fragrant and beneficial in aromatherapy—the molecules released as vapor into the air carry the essential oil's scent. For example, if you apply coconut oil to your skin, it will still appear "oily" or "greasy" two minutes later, whereas if you apply frankincense oil to your skin, there will be no trace of it because some has evaporated and the rest has penetrated your skin and is being passed deeply into the cells, tissues, organs, and bloodstream.Essential oils are extracted from plants, including flowers, leaves, roots, barks, and peels, utilizing steam distillation, cold pressing, or CO2 extraction methods. Some companies sell plant extracts marketed as essential oils, but a true essential oil must be extracted without the use of chemical solvents. (34)

3.Some plants used in aromatherapy:

Many plants have been reported to use in the aromatherapy due to presence of essential or volatile oils in different plants' materials like flowers, barks, stem, leaves, roots, fruits etc. Some of the plants used in aromatherapy are summarized in Table 1.

Table No. 1. Plants producing essential oils (35)

Essential oils	Parts of the plant
Bergamot, lemon, lime, sweet orange, tangerine, mandarin	Fruit peel
Cinnamon	Bark
Citronella, lemongrass, petitgrain, palmarosa, patchouli	Leaves
Geranium, lavender, rosemary, spike lavender	Entire plant

1.Lavender

Lavender (Lavandula officinalis Chaix.), a charming garden herb from the Lamiaceae family (Figure 1). It contains camphor, terpinen-4-ol, linalool, linalyl acetate, beta-ocimene, and 1,8-cineole [32]. Lavender essential oil is a volatile, aromatic plant oil used in aromatherapy and traditional medicine. Lavender is a herbaceous perennial aromatic plant from the mint family, Lamiaceae, with antifungal, antibacterial, laxative, antibloating, and sedative qualities (36).Its chemical concentrations and therapeutic effects vary depending on species. Linalool and linalyl acetate have maximum and excellent absorption properties from the skin during massage, resulting in central nervous system depression. Linalool has calming effects, whilst linalyl acetate has strong narcotic properties.

Figure No. 2- Lavender

These two activities may explain its usage in lavender pillow anxiety patients with sleep disturbance patterns, as it improves feelings of well-being, supports mental alertness, and suppresses aggression and anxiety [37]. Lavender oil exhibits antibacterial and antifungal activity against a wide range of bacteria, particularly when antibiotics fail to function, although the precise processes remain unknown. When it comes to aromatherapy, it has been extensively established for treating abrasions, burns, tension, headaches, promoting new cell formation, skin disorders, uncomfortable muscles, and stimulating the immune system [38, 39, 40].

2.Lemon

Lemon [Citrus limon Linn. (C. limon)] belongs to the family of Rutaceae (Figure 2).C. limon trees grow up to 15 feet tall and produce juicy, perfumed lemon fruits all year. Its oil ingredients are high in the terpenes d-limonene and l-limonene, which make up around 90% of the oil. Phellandrene, pinene, and sesquiterpene are also detected [32]. The remaining 10% of the oil is made up of oxygenated substances, primarily the aldehyde citral, which is responsible for the oil's odor and accounts for 3.5% to 5% of the total odor. When compared to other essential oils, its components are antibacterial, astringent, and detoxifying for blemishes linked with oily skin (41).Its oil brightens and refreshes dull skin. Lemon essential oil is primarily used to improve the immune system and increase white corpuscle

formation, as well as to combat acidity and ulcers via citric acid, which aids digestion by producing potassium and calcium carbonates and bicarbonates [38][39].

Figure No. 3- Lemon

A recent double-blind, randomized, controlled clinical trial study on aromatherapy found that citrus oil is effective in easing first-stage labor pain. It is efficient at controlling nausea and vomiting, as well as elevating mood [42] [43] [44].

3.Roman chamomile

Roman chamomile (Anthemis nobilis Linn.) belongs to the family of Asteraceae (Figure 3). For generations, this plant has been regarded for its ability to calm, moderate, and powerful emotions. It has daisy-like blossoms. The main components of Roman chamomile oil are esters of angelic acid, tiglic acid, and 2-methylbutanoic acid. Chamazulene, a sesquiterpenoid, gives the freshly distilled oil its bluish tinge. It is high in pinocarvone, farnesol, pinene, bisabolol, cineole, pinocarveol, beta-caryophyllene, azulene, camphene, and myrcene.Chamomile formulations have shown promise in treating a variety of human problems, including hay fever, inflammation, muscle spasms, menstrual disorders, sleeplessness, ulcers, wounds, gastrointestinal disorders, rheumatic pain, and hemorrhoids. It is used in cosmetics and aromatherapy due to its anxiolytic qualities [45, 46].

Figure No.4- Roman chamomile

4.Ylang Ylang

Ylang–ylang (Cananga odorata Hook. F. & Thoms) belonging to the family of Annonaceae, native to Madagascar, Indonesia and Philippines is a small tree (Figure 4). Geranyl acetate, linalol, geraniol, farnesol, benzyl acetate, geranial, methyl chavicol, beta-caryophyllene, eugenol, pinene, and farnesene are some of its chemical components. This tree's greatest quality is its ability to slow down rapid respiration and heartbeat, which makes it ideal for shock and trauma situations. It has euphoric and antidepressant qualities [46], which contribute to a sense of wellbeing. low self-esteem and postmenopausal symptoms in women, which contribute to their sense of wellbeing. Women with low self-esteem and post-menopausal syndrome perform better. A pilot study including 34 professionals from a nursing group was conducted in Portugal to confirm the use of ylang ylang essential oil in alleviating anxiety and enhancing self-esteem, as well as affecting blood pressure and temperature. The findings clearly demonstrated that using this herb resulted in a significant increase in self-esteem [47]. Furthermore, its aphrodisiac benefits stem from its unique aroma, which is beneficial to both dry and oily skins. It is also used to treat depression, anxiety, hypertension, frigidity, stress, and palpitations [48].

Figure No.5- Ylang -ylang

5. Peppermint

Peppermint [Mentha piperita Linn. (M. piperita)] belongs to the family of Lamiaceae (Figure5). Currently, all 600 varieties of mints are grown from 25 well-defined species. The two most important are peppermint (Mentha piperita) and spearmint. Spearmint has a powerful, sweet scent with a harsh menthol undertone. The oil contains carvacrol, menthol, carvone, methyl acetate, limonene, and menthone. The pharmacological activity is attributed to menthol, a key component of peppermint oil. Peppermint oil contains at least 44% of free menthol. Components are susceptible to climate, latitude, and plant maturity. Menthol inhalation and application to the skin both elicit a response. In dosage form, it is utilized in numerous liniments to treat arthritic issues and pain flare-ups. The anti-inflammatory, analgesic, anti-infectious, antimicrobial, antiseptic, antispasmodic, astringent, digestive, carminative, fungicidal, nervine stimulant, vasoconstrictor, decongestant, and stomachic qualities of peppermint oil have all been researched and recorded [49, 50].

Figure No.6- M. piperita Linn.

4.Pharmacological actions of essential oils

1.Antibacterial

Many essential oils were tested for antibacterial activity against Gram-positive and Gram-negative bacteria, as well as antifungal qualities. These essential oils have been extensively examined for their antibacterial capabilities, and they have demonstrated some really encouraging results against salmonella, staphylococci, and other oral infections. They can be excellent alternatives to antibiotics if adequately and thoroughly examined for their effects [51, 52, 53].

2.Antifungal

Melaleuca alternifolia (tea tree) oil tested positive for antifungal activity in vitro, with the exception of beta-myrcene. Hammer et al. discovered that the majority of the components of tea tree oil showed fungicidal properties, particularly against dermatophytes and filamentous fungi [54].

3.Anti-inflammatory

Tea tree oil decreased the human histamine response to flare and weal. After 10 minutes, topical treatments with 100% tea tree oil can lessen the irritation caused by histamine diphosphate [55]. According to available data on

different essential oils, noncytotoxic doses increase the synthesis of interleukin-10, which has an anti-inflammatory effect [56].

4.Antiviral

Deans and Ritchie evaluated the antiviral activity of M. ericifolia, M. leucadendron, M. armillaris, and Melaleuca styphelioides essential oils on kidney cells of African green monkeys using a plaque reduction assay on herpes simplex virus type 1 and found that M. armillaris had the best results (up to 99%), followed by M. leucadendron (92%), and M. ericifolia (91.5%) [57].

5. Anti-oxidant

In vitro, the essential oil extracted from Nigella sativa L. seeds is a powerful antioxidant with strong hydroxyl radical scavenging properties. Kanuka (Kunzea ericoides), Manuka (Leptospermum scoparium), and Leptospermum petersonii have strong antibacterial and antioxidant activities. M. armillaris essential oil has strong antioxidant properties; it modifies superoxide dismutase characteristics and increases vitamin E and C concentrations [58]. Free radicals created during inflammation can cause gene mutations and posttranslational changes to numerous proteins. If not, eliminating it may cause harmful radicals to the entire system. This pathway is typically counteracted by the antioxidant capabilities of substances. Various plants, such as Thymus vulgaris, C. limon, E. globulus, and Cupressus sempervirens, have exhibited antiinflammatory benefits in animal studies [59].

Applications of essential oils in aromatherapy

1. Promoting sleep

2.Reduction of anxiety before surgery

3.Managing nausea and vomiting after surgery

4. For the anxiolytic effect [33]

5.Clinical Evidence for Aromatherapy in Insomnia:

Studies demonstrate aromatherapy's efficacy in improving sleep quality:

1. Lavender oil: Improved sleep quality in patients with chronic insomnia (Lee et al., 2014)
2. Bergamot oil: Reduced anxiety and improved sleep in patients with insomnia (Navarra et al., 2015)
3. Chamomile oil: Improved sleep quality in elderly patients (Adib-Hajbaghery et al., 2017)

6.Practical Considerations:

1. Use high-quality, pure essential oils.
2. Diffuse oils in a well-ventilated area.
3. Individualize oil blends based on personal preferences.

4. Combine aromatherapy with relaxation techniques.

7.Future Directions:

1. Standardize aromatherapy protocols for insomnia.
2. Investigate synergistic effects of essential oil blends.
3. Conduct large-scale, randomized controlled trials.

8.Conclusion

From above reports and study, we can conclude that aromatherapy is natural and noninvasive gift of nature for humans. It's not only the disease symptoms which are eradicated but the whole body is rejuvenated by the use of aroma. Aromatherapy regulates the physiological, spiritual and psychological upliftment for the new phase of life. This therapy is not only preventive but also can be used in the acute and chronic stages of disease. Pharmaceutical industries are trying for environmental friendly, alternative and natural medicine for disease associated with pathogens and metabolism. There may be a possibility of enhancing the rate of reaction and bioavailability of drugs from the use of these essential oils.

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