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A Review Paper on the Role of *Shirodhara* A Non-Pharmacological Intervention in the Management of Insomnia.

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ABSTRACT:

Objective: The goal of this study was to look at the mode of action of *Shirodhara* and how it affects the levels of neurotransmitters in those who suffer from insomnia.

Data Source: *Brihatrayi* and *Laghutrayi* were accessed through the NIIMH website, as well as newer texts both online and offline.

Review Method: The mode of action of *shirodhara* and its influence on sleep-regulating neurotransmitters were the main topics of discussion in the literature study. For scientific explanation and therapeutic application, both *Ayurvedic* and modern texts have been assembled with its effect on neurotransmitter levels.

Result: The current period of pandemic conditions, as well as Covid-like events, has resulted in a slew of mental health concerns and sleep disturbances. It has been discovered that stressful situations produce a neurotransmitter imbalance. Quality sleep may heal half of all ailments, which is why it is considered one of life's essential sub-pillars. Additionally, due to its effectiveness and lack of side effects, a movement from pharmacological to nonpharmacological therapy has been noted.

Conclusion: *Shirodhara* therapy is a *panchakarma* procedure in which a medicinal liquid is poured continuously and rhythmically over the forehead. *Acharya Vagbhatta* characterized it as a sort of *Moordhini taila*. *Shiroabhyang*, *Shiroseka*, *Shiropichu*, and *Shirobasti* are all part of the *Moordhinitaila*. Sleep is an important component in determining life expectancy. *Shirodhara* therapy is regarded as an excellent nonpharmacological treatment for insomnia in *Ayurveda*.

Keywords: *Nidra*, Insomnia, *Moordhinitaila*, *Shirodhara*, Neurotransmitters.

INTRODUCTION

The quality of our sleep has a direct impact on our physical and emotional well-being. In this current epidemic, everyone is confronted with everyday undesired conditions that result in stress, worry, and sadness. All of these factors

disrupt the body's physiological functioning by causing neurochemical disruptions and affecting people's sleep. As we all know, inner fitness is critical in combating the current scenario. Diet and sleep are the most important factors in our physical and mental wellness. According to



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Ayurveda, good diet and sleep are essential for body maintenance and lifespan. Furthermore, both of these factors are linked to metabolic problems^[1]. As a result, *Nidra* is regarded as a vital sub-pillar^[2] and as one of the non-suppressible desires in *Ayurveda*^[3]. Lord Krishna says in the *BhagwadGita* that those who eat well, exercise regularly, and sleep well will never be afflicted by sorrow^[4]. Good sleep, according to *Acharya Kashyap*, is a sign of good health^[5]. With recent breakthroughs in insomnia treatment techniques in modern science, there is a movement towards cognitive behavioural therapy, which is deemed more beneficial than pharmacological intervention in primary and secondary insomnia. *Shirodhara* is a *Panchakarma* technique used to alleviate sleeplessness in *Ayurveda*. A medicinal fluid is poured over the forehead during this procedure. There is a disruption in the amount of neurotransmitters in insomnia. According to its mechanism, it can create changes in the balance of neurotransmitters that cause insomnia. That is also why it is a successful nonpharmacological intervention.

Definition

In *Vachaspatyam*, the word "*Anidra*" is defined as "*Na Nidra abhavarthe*," which translates to "sleep deprivation"^[6]. It also includes "*Asvapana*"^[7] under *Vatanaanatmaj vikara*. When a person's mind becomes fatigued, either from physical or mental exertion, he or she falls asleep^[8], according to *Acharya Charka*. *Vata, pitta, mana santap, kshaya, and abhigataj*^[9] are the aetiologies of insomnia, According to *Sushruta*. an in-depth examination of these components may reveal that it is caused by worry, stress, depression, *Kapha* humor depletion, or external trauma. The word "insomnia" comes from the Latin words "in" (no) and "Somnus" (sleep). It's a sleep disorder that manifests itself as an inability to sleep or a complete loss of sleep. Insomnia clinically shows as a subjective impression of unhappiness with either the amount or the quality of sleep, according to Johann Heinroth's first psychosomatic disorder description in 1818^[10]. According to recent research, sleeplessness can be a separate disorder. Insomnia can be classed using the DSM categorization system, or it can be categorised based on how long it lasts (transient, short-term, or chronic). Insomnia is defined as taking longer than 30 minutes to fall asleep, awakening multiple times during the night accumulating >30 minutes of alertness, and sleeping less than 6.5 hours with daytime weariness. According to the DSM-5 categorization, insomnia is defined as the inability to get enough sleep and includes three primary complaints^[11] :

1. Insomnia due to a lack of sleep. (inability to fall asleep)
2. Frequently waking up in the middle of the night. (sleep deprivation marked by frequent awakenings)
3. Early morning wake-up calls. (Being unable to get back asleep after waking up early in the morning.)

Co morbidities and Prevalence

Insomnia affects 10-30% of people globally, according to various research, and is more common in older adults, females, and people who have medical or psychiatric problems^[12]. Insomniacs have a higher risk of cardiac, metabolic, and neurocognitive problems, according to one study^[13], since it activates the stress system and physiological arousal system. Prolonged wakefulness has been shown in studies to promote gradual dysfunction of mental processes as well as aberrant behavioural actions. Sleep is essential for the restoration of brain functioning and the normalization of the body's important processes. Elderly persons, feminine gender, comorbid (medical, mental, sleep, and drug use) illnesses, shift work, and maybe unemployment and lower socioeconomic position are all consistent risk factors for insomnia. Patients with concomitant medical and psychiatric illnesses are at a far higher risk, with insomnia rates as high as 50% to 75% in psychiatric and chronic pain diseases. Insomnia and psychiatric diseases appear to have a bidirectional risk link. Several studies have also found an elevated incidence of psychiatric illnesses in people who have experienced first sleeplessness.

Sleep Neuroanatomy^[14]

Medullary reticular formation, thalamus, and basal forebrain are the primary structures involved in sleep production. The midbrain, subthalamus, and basal forebrain are responsible for alertness, while the brainstem reticular formation, midbrain, and subthalamus are responsible for sleep. After a thorough examination of sleep regulation mechanisms, it was discovered that the primary pathophysiology is in sleep start and maintenance, which is largely dependent on the levels of neurotransmitters involved in sleep promotion and wakefulness.

Sleep-inducing neurotransmitters

Melatonin is a hormone that aids in the initiation of sleep^[15]. The anterior hypothalamus contains the ventrolateral preoptic nucleus, which contains GABA receptor and peptide Galanin, both inhibitory neurons. They deliver signals to the tuberomammillary nucleus and the brain stem, causing awake inhibition and sleep promotion. Norepinephrine aids in the creation of melatonin, which aids in the induction of sleep.

Wakefulness neurotransmitters^[16]

Dorsal raphe nuclei contain serotonin-serotonergic nuclei. Sleep disturbances occur when serotonin levels go too low. Histamine is found in histaminergic cells in the posterior hypothalamus's tuberomammillary nucleus, which is responsible for wakefulness. In the ventral tegmental region, dopaminergic neurons can be found. It disrupts sleep by blocking the conversion of norepinephrine to melatonin. Increased REM (rapid eye movement) sleep patterns are linked to acetylcholine- Ach neurotransmitters in the basal forebrain. Orexin is a neuropeptide that stimulates different brain nuclei that play important roles in wakefulness, including as the dopamine, histamine, and acetylcholine systems.

Insomnia Pathophysiology

There is a decrease in GABA and galanergic neurons in the ventrolateral preoptic neuronal structure due to psychological causes or another reason. One important factor is that as melatonin levels drop, so do the levels of the other two neurotransmitters. Furthermore, these both become inactive and unable to regulate numerous separate awake centers, resulting in an increase in histaminergic neurons, dopamine neurotransmitters, and a decrease in Serotonin levels, all of which are linked to sleep disruption. Some possible approaches for understanding the underlying pathophysiology of insomnia are discussed in advance.^[17]

a) Homeostasis is influenced by the length of time spent awake. b) Circadian- Transmit stimulatory signals to arousal networks in opposition to the homeostatic desire to sleep to promote wakefulness. c) The flip-flop model was developed by Saper and colleagues. It is made up of two sets of components that are mutually inhibiting. VLPO (GABA and Galaninergic Neurotransmitter) is found on one arm, while TMN (histaminergic neurons) and brainstem arousal areas are found on the other (Serotonergic, dopaminergic neurons, and Acetylcholine). If one side is somewhat more activated than the other, the weaker side will be inhibited, and vice versa.

Insomnia treatment methods^[18]

The fundamental goal of treatment, according to the AASM (American Academy of Sleep Medicine), is to

1. To increase the quality of sleep
2. To alleviate the associated daytime impairment.

The treatment of insomnia, according to the guidelines, comprises both pharmaceutical and nonpharmacological therapies. Short-acting, intermediate-acting, and long-acting benzodiazepines, sedative and hypnotic medicines, Ramelteon (Melatonin receptor agonist), antidepressants,

antihistamines, and orexin inhibitors are some of the pharmacological therapies. Nonpharmacological therapies are more helpful in insomnia, according to modern science's shards of data. In addition, according to AASM standards, psychological and behavioural therapies are more helpful in treating chronic and primary insomnia. It can be used as a stand-alone treatment or in conjunction with pharmaceutical treatments. In Ayurveda, a full explanation of non-pharmacological treatments for insomnia is given, including *Abhyanga* (massaging), *Moordhini taila* (various types of oil applications over the forehead), *Udavartan* (rubbing the body with powdered medicine), and *Samvahana* (sleeping on the floor) (light body message). *Vagbhatta* defines *Moordhini taila* as the external application of medications over the forehead. *Shiro-Abhyanga*, *Seka*, *Pichu*, and *Basti* are the four therapies included^[19]. This type of *Seka* therapy, also called as *Dhara* therapy or *Shirodhara*, has long been used to alleviate sleeplessness. *Shirodhara* provides *Sthirata* (Stability) of body, mind, and speech, increases appetite, produces calmness, improves speech quality and vision, softens skin texture, nourishes *dhatu* (*Shukra* and *artva*) and enhances longevity, and is helpful in inducing good sleep, according to the benefits of *Shirodhara* as elaborately explained in the Classical text *Sahasrayoga*.

Shirodhara Mechanism of Action in Insomnia-

Changes in hormones and neurotransmitters cause insomnia, which is characterized by difficulty initiating and maintaining sleep. *Shirodhara* therapy can produce changes in hormones and neurotransmitters, which can assist keep the body in balance. *Shirodhara's* mechanism can be deduced at the following levels:-

The consequence of impulse generation.

1. Temperature's Impact
2. Absorption via the scalp
3. During the procedure, the dim light has an effect.
1. Effect of Impulse Generation- In *Shirodhara* therapy, a continuous stream of liquid is poured over the forehead, creating a steady pressure. Through the hollow sinus, this constant pressure amplifies and creates impulses, which are then sent within via cerebrospinal fluid^[20]. This impulse activates sleep-regulating parts of the brain, causing Melatonin, GABA, and Serotonin levels to normalize, as well as a drop in Histamine, Acetylcholine, and Dopamine levels. The temperature of the liquid poured over the forehead in this therapy is usually higher than the temperature of the body. According to one study, a slight local increase in temperature causes neuronal activity, which is linked to sleep patterns, and suppressing this

causes awake. Mild skin warming has also been linked to sleep-like activity in the cerebral cortex and the reticular formation of the midbrain [21].

2. Absorption through the scalp vein- Drugs are absorbed through the scalp vein after being poured locally for 30-45 minutes in *Shirodhara*. Drugs enter the systemic circulatory system through emissary veins in the scalp [22]. One study in Japan found that drug delivery through the scalp is a viable route for drug administration. *Shirodhara* may thus aid in achieving the desired results [23].
3. *Shirodhara* therapy is performed under dark light, which has an effect on the procedure. The explanation for this could be that melatonin hormone is released more under dim light, which aids in sleep initiation [24]. As a result, this therapy must be performed in a suitable environment.

CONCLUSION

The preceding discussion concludes that optimal sleep requires a balance of neurotransmitters involved for sleep initiation and sleep maintenance. *Shirodhara* therapy can aid in the release of enough melatonin and the normalization of Serotonin and other neurotransmitters. *Shirodhara*, a nonpharmacological treatment for insomnia, can thus be employed as cognitive behavioural therapy. However, in order to collect evidence-based data, thorough research and clinical studies must establish *Shirodhara* influence on numerous neurotransmitters.

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