

Sleep and Its Disorders: Ayurvedic Physiology of Nidra and Its Modern Neuro-Physiological Correlates

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ABSTRACT

Sleep is an essential biological process that ensures physical, mental, and emotional well-being. In Ayurveda, sleep or Nidra is considered one of the three pillars of health along with Ahara (nutrition) and Brahmacharya (controlled lifestyle). Nidra is vital for maintaining the balance of Tridosha—Vata, Pitta, and Kapha—and promoting mental clarity and overall health. Modern neurophysiology explains sleep as a complex process involving various neural circuits, neurotransmitters, and hormonal regulation. Sleep disorders such as insomnia, hypersomnia, sleep apnea, and parasomnias affect millions globally, leading to cognitive impairments, metabolic disturbances, and emotional instability. This paper aims to provide a comparative insight into the Ayurvedic understanding of Nidra and its modern neuro-physiological correlates, highlighting commonalities, differences, and potential integrative approaches to managing sleep disorders.

KEYWORDS: *Sleep, Nidra, Tridosha, Neurophysiology, Insomnia, Sleep Disorders, Ayurveda*

INTRODUCTION

Sleep is a fundamental physiological process essential for maintaining physical, mental, and emotional health. It is a naturally recurring state characterized by altered consciousness, reduced responsiveness to external stimuli, and relative inactivity of voluntary muscles. Sleep is not merely a passive state of rest; it is a dynamic process involving complex interactions

between neural circuits, neurotransmitters, and hormonal mechanisms. Proper sleep is critical for cellular repair, cognitive functioning, emotional regulation, and overall homeostasis. Chronic sleep disturbances are associated with increased risk of metabolic disorders, cardiovascular diseases, neurological impairments, and mental health problems such as anxiety and depression.

In Ayurveda, the ancient science of life, sleep is described as Nidra, one of the three essential pillars of health, along with Ahara (proper nutrition) and Brahmacharya (controlled lifestyle and self-regulation). Nidra is considered vital for maintaining the balance of Tridosha—Vata, Pitta, and Kapha—which govern physiological and psychological functions. Adequate Nidra promotes mental clarity, emotional stability, and physical rejuvenation, whereas disturbed or insufficient Nidra leads to imbalance in Doshas, resulting in physical ailments, psychological stress, and compromised immunity. Ayurveda also emphasizes the quality of sleep, classifying it into different types such as Pravritti Nidra (sound and refreshing sleep), Apravritti Nidra (disturbed sleep), and Avasa Nidra (deep, dreamless sleep). Dream states, or Swapna, are also recognized as an important aspect of sleep that reflects mental activity and Dosha influences. Modern science, on the other hand, investigates sleep through neurophysiological and biochemical frameworks. Sleep is classified into Non-Rapid Eye Movement (NREM) and Rapid Eye Movement (REM) stages, each characterized by distinct brain wave patterns and physiological functions. NREM sleep, particularly deep sleep (N3 stage), is crucial for physical restoration, immune system functioning, and hormone regulation. REM sleep is associated with cognitive processing, memory consolidation, and emotional regulation. Neurotransmitters such as gamma-aminobutyric acid (GABA), serotonin, and melatonin play pivotal roles in sleep initiation and maintenance, while circadian rhythms regulate sleep-wake cycles. Disruptions in these processes can lead to various sleep disorders, including insomnia, hypersomnia, sleep apnea, and parasomnias.

The rising prevalence of sleep disturbances worldwide is a reflection of modern lifestyle challenges such as increased stress, erratic work schedules, excessive use of electronic devices, and dietary imbalances. These factors often lead to poor sleep quality and quantity, causing long-term health consequences. Integrating the Ayurvedic understanding of Nidra with modern neurophysiological insights can provide a more holistic approach to sleep management. Such integration allows for personalized interventions that consider both individual constitution

(Prakriti) and neurobiological mechanisms, potentially enhancing the effectiveness of treatments for sleep disorders.

The present paper aims to explore the Ayurvedic physiology of Nidra, examine its correlation with modern neurophysiological concepts of sleep, and discuss the implications for understanding and managing sleep disorders. By bridging traditional wisdom and contemporary science, this study highlights the significance of a complementary approach to optimize sleep health and improve overall well-being.

LITERATURE REVIEW

Ayurvedic Perspective on Nidra

Table 1: Ayurvedic Classification of Nidra and Dosha Imbalance

Type of Nidra	Description	Associated Dosha	Common Sleep Disturbances
Pravritti Nidra	Sound, refreshing sleep	Balanced Dosha	None / Healthy sleep
Apravritti Nidra	Disturbed or insufficient sleep	Vata or Pitta aggravated	Insomnia, restlessness
Swapna	Dreaming sleep	Pitta imbalance	Nightmares, vivid dreams
Avasa Nidra	Deep, dreamless sleep	Kapha imbalance	Hypersomnia, excessive sleep

Ayurveda categorizes Nidra as a vital biological process necessary for maintaining equilibrium in the body and mind. The quality and duration of Nidra are influenced by the balance of Tridosha:

- **Vata Dosha:** Governs the nervous system and regulates the onset of sleep. An aggravated Vata may cause insomnia, restlessness, and frequent awakenings.
- **Pitta Dosha:** Controls metabolism and digestion. Excess Pitta may lead to early waking, nightmares, and disturbed sleep.
- **Kapha Dosha:** Provides stability and grounding. Excess Kapha may cause excessive sleepiness or lethargy.

Ayurveda further describes the classification of Nidra based on the quality:

- **Pravritti Nidra:** Sound and refreshing sleep
- **Apravritti Nidra:** Disturbed or insufficient sleep
- **Swapna:** Dreams during sleep
- **Avasa Nidra:** Deep, dreamless sleep

Ayurvedic texts also emphasize the role of **Ahara (diet)**, **Dinacharya (daily routine)**, **Ritucharya (seasonal routine)**, and **mental health** in maintaining proper sleep. Herbs like Ashwagandha, Jatamansi, and Brahmi are prescribed for improving sleep quality.

Modern Neuro-Physiological Correlates of Sleep

Table 2: Modern Sleep Stages and Neurophysiological Correlates

Sleep Stage	Duration (%)	Neurophysiological Activity	Function
NREM Stage 1	5–10%	Light sleep, slow eye movement	Transition from wakefulness to sleep
NREM Stage 2	40–50%	Sleep spindles, K-complexes	Memory consolidation, sensory processing
NREM Stage 3	20–25%	Slow-wave delta activity	Physical restoration, immune support
REM Sleep	20–25%	Rapid eye movement, high brain activity	Dreaming, emotional processing, learning

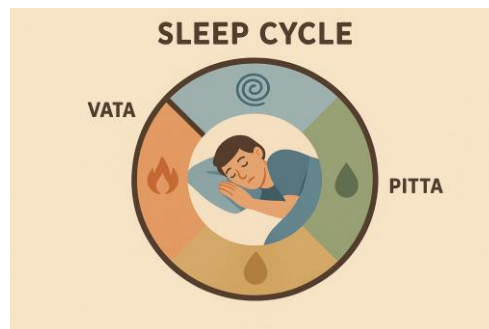


Figure 1: Sleep Cycle Diagram with Ayurvedic Overlay

Modern science classifies sleep into two main stages: **Rapid Eye Movement (REM)** and **Non-Rapid Eye Movement (NREM)**.

- **NREM Sleep:** Includes stages N1, N2, and N3. N3 or deep sleep is crucial for physical restoration, immune function, and hormonal regulation.
- **REM Sleep:** Associated with dreaming, emotional processing, and memory consolidation.

Neurotransmitters play a critical role in sleep regulation. **GABA** promotes sleep by inhibiting excitatory signals, while **serotonin** and **melatonin** regulate circadian rhythms. Dysregulation in these neurotransmitters may lead to insomnia or other sleep disorders.

Sleep Disorders

Sleep disorders are classified as follows:

- **Insomnia:** Difficulty falling or staying asleep
- **Hypersomnia:** Excessive daytime sleepiness
- **Sleep Apnea:** Interruption of breathing during sleep
- **Parasomnias:** Abnormal movements, behaviors, or emotions during sleep
- **Circadian Rhythm Disorders:** Misalignment of internal clock with external environment

Epidemiological studies suggest that modern lifestyle factors such as stress, irregular schedules, excessive screen time, and caffeine intake contribute significantly to sleep disturbances.

AYURVEDIC AND MODERN CORRELATION



Figure 2: Comparison of Dosha Imbalance and Sleep Disorders

Dosha Imbalance and Neurophysiology

Ayurvedic principles of Vata, Pitta, and Kapha can be correlated with neurophysiological mechanisms:

- **Vata Imbalance:** Hyperactive neural circuits leading to insomnia, similar to overactive sympathetic nervous system.
- **Pitta Imbalance:** Hypermetabolism and inflammatory responses affecting sleep onset and maintenance.
- **Kapha Imbalance:** Sluggish neurotransmission and excessive GABA activity resulting in hypersomnia.

Role of Lifestyle and Diet

Ayurveda emphasizes Dinacharya and Ahara for optimal sleep, which aligns with modern findings on the impact of regular sleep schedules, balanced nutrition, and stress management on sleep quality.

Herbal Interventions and Neurochemical Effects

Ayurvedic herbs like Ashwagandha have been found to modulate GABAergic activity, while Brahmi and Jatamansi influence serotonin and melatonin pathways. These herbal interventions offer a bridge between traditional and modern therapies for sleep disorders.

CHALLENGES IN SLEEP MANAGEMENT

Modern Challenges

- Increasing prevalence of lifestyle-induced sleep disorders
- Over-reliance on pharmacological interventions like hypnotics and sedatives
- Difficulty in managing chronic insomnia and sleep apnea

Ayurvedic Challenges

- Variability in Dosha constitution among individuals makes standardized treatment difficult
- Limited clinical trials validating efficacy of traditional herbs in sleep disorders
- Integrating Ayurvedic principles with modern clinical protocols requires careful monitoring

SCOPE AND FUTURE DIRECTIONS

Integrative Approaches

Combining Ayurveda with modern neurophysiology can enhance sleep management. Potential strategies include:

- Personalized sleep plans based on Dosha assessment and neurophysiological evaluation
- Use of Ayurvedic herbs in conjunction with behavioral therapy or cognitive techniques
- Emphasis on lifestyle modification, meditation, and yoga to regulate sleep-wake cycles

Research Opportunities

- Clinical trials to assess efficacy of Ayurvedic interventions on neurotransmitter regulation
- Investigating genetic and epigenetic influences on Dosha-related sleep patterns
- Developing integrative guidelines for managing chronic sleep disorders using Ayurveda and modern medicine

CONCLUSION

Sleep is an indispensable component of health, with profound implications on physical, mental, and emotional well-being. Ayurveda's Nidra concept offers a holistic framework that emphasizes Dosha balance, lifestyle, and herbal support, while modern neurophysiology provides a mechanistic understanding of sleep stages, neurotransmitters, and circadian regulation. Integrating both approaches can help address sleep disorders more effectively, offering personalized interventions that cater to individual constitutions and neurophysiological needs. Continued research and clinical trials are necessary to validate these integrative strategies and improve quality of life for individuals suffering from sleep disturbances.

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