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RESEARCH ARTICLE

Sleep Hygiene Through the Framework of Nidra: An Integrative Review of Physiological, Psychological, and Social Dimensions

Vaibhav Shukla[1], Pankaj Sharma[2]

[1] Undergraduate Studies, Shri BM Kankanawadi Ayurveda Mahavidyalaya, PG Studies & Research Centre, KLE Academy of Higher Education & Research (Deemed-to-be-University), Belagavi, Karnataka, India

[2] Department of Rejuvenative and Reproductive Medicine in Ayurveda, Shri BM Kankanawadi Ayurveda Mahavidyalaya, PG Studies & Research Centre, KLE Academy of Higher Education & Research (Deemed-to-be-University), Belagavi, Karnataka, India

Editorial queries: admin@chirantanjournal.in

ORCID: Vaibhav Shukla 0009-0003-9570-0068; Pankaj Sharma 0009-0004-1223-4653

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ABSTRACT

Background: Sleep, or Nidra in Ayurveda, is a foundational pillar of health alongside food (Ahara) and lifestyle control (Brahmacharya). The WHO recognises insufficient sleep as a global health epidemic, with India ranked as the second most sleep-deprived nation. Modern life often prioritises work, digital engagement, and social interactions over adequate sleep. Objective: This write-up explores the significance of Nidra through a synthesis of classical Ayurveda and contemporary sleep science, focusing on sleep hygiene practices. Methods: A narrative review was conducted using texts from the Brihattrayi (Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya), peer-reviewed journals, WHO and NSF reports, and classical commentaries. Analyses of clinical implications were performed. Results: Nidra has crucial physiological roles, affecting memory, hormone secretion, immune function, cardiovascular health, and metabolism, all linked to Ayurvedic concepts like Dhatu Poshana and Ojas. Psychologically, sleep deprivation disrupts cognition, emotions, and mental health, significantly increasing depression risk. Socially, inadequate sleep affects academic performance, economy, public safety, and family dynamics, illustrating modern consequences of Prajnaparadha. The write-up proposes an integrative Nidra-Preserving Protocol combining Dinacharya/Ratricharya with evidence-based sleep hygiene. Conclusion: Both Ayurveda and modern sleep science emphasise Nidra's vital role in biological, psychological, and social health. Prioritising sleep as a key aspect of preventive medicine is a pressing health imperative for the twenty-first century.

KEYWORDS

Ayurveda; Nidra; Sleep Hygiene Practices; Sleep Deprivation; Trayopastambha

1. Introduction

Sleep is not a luxury. It is a biological imperative, a physiological necessity, and, as Ayurveda recognised ages before the birth of modern neuroscience, one of the three foundational pillars upon which human life itself rests. In classical Ayurveda, Sleep or Nidra occupies a position of profound clinical significance, enumerated among the Trayopastambha (three foundational pillars) alongside Ahara (diet) and Brahmacharya (regulated conduct of organoleptic faculties), and explicitly described as the determinant of happiness and sorrow, nourishment and emaciation, strength and weakness, knowledge and ignorance, fertility and impotence, and life itself (Kushwaha, 2022; Sharma et al., 2024; Shastri, 2009). Yet despite this ancient recognition, the modern world has constructed a civilisation hostile to healthy sleep. The WHO recognises insufficient sleep as a global public health epidemic (World Health Organization, 2024). India is the second most sleep-deprived country in the world, with over 40 million individuals worldwide estimated to suffer from recognised sleep disorders and over 60% of adults reporting sleep problems on multiple nights weekly (Acharya et al., 2023; Bindusree et al., 2024). Artificial light, round-the-clock digital connectivity, blue-light-mediated melatonin suppression, chronic stress, stimulant use, and

irregular schedules have collectively dismantled the natural rhythms within which healthy sleep is possible. (Roy et al., 2026; Hyndych et al., 2025; World Health Organization, 2024)

What makes the present moment historically significant is the convergence between modern scientific findings and classical Ayurvedic understanding. Ayurveda described, through Doshas, Dhatus, Ojas, Bala, Manas, and Trayopastambha, relationships between sleep and health that modern physiology now explains through chronobiology, neuroendocrinology, immunology, and sleep architecture research (Sharma et al., 2024; Shastri, 2009; Vignesh et al., 2024). This convergence is not superficial; both traditions, separated by millennia, describe the same biological reality through different epistemological frameworks. Central to this integrative vision is sleep hygiene, the set of behavioural and environmental practices that promote regular, sufficient, and restorative sleep. A 2024 study identified three thematic clusters constituting sleep hygiene: behavioural factors, environmental factors, and individual modifiability, clusters that map with remarkable fidelity onto the classical frameworks of Ayurveda namely Dinacharya, Ratricharya, Ahara Vidhi, and Sadvritta (De Pasquale et al., 2024).

This paper examines the physiological, psychological, and social importance of Sleep or Nidra in the modern era, with special reference to sleep hygiene practices. It aims to synthesise Ayurvedic and modern conceptual frameworks for sleep, to analyse Nidra's importance across physiological, psychological, and social dimensions, to examine sleep hygiene from classical and contemporary perspectives, and to propose an integrative Nidra-Preserving Protocol applicable to the modern era.

2. Methodology

This paper constitutes an integrative review combining classical Ayurvedic scholarship with contemporary biomedical evidence. Classical sources include the Brihattrayi, i.e., the Charaka Samhita, Sushruta Samhita, and Ashtanga Hridayam, with commentary by Sri Chakrapani Dutta and relevant Laghutrayi texts. Contemporary evidence was sourced from PubMed, Scopus, and Google Scholar using search terms including 'Nidra AND Ayurveda,' 'sleep hygiene,' 'sleep deprivation AND physiology,' 'insomnia AND psychological effects,' 'social consequences of sleep disorders,' and 'Yoga Nidra AND randomised controlled trial.' Publications from 2016 to 2026 were included in this study. Titles and abstracts returned by these searches were screened for direct relevance to the review's three organising dimensions: the physiological, psychological, and social importance of Nidra and sleep hygiene. Full texts of records passing this initial screen were then read in full to confirm topical relevance, source credibility, and, where applicable, methodological transparency, with priority given to peer-reviewed original research, systematic reviews, and meta-analyses over non-peer-reviewed material. As this is a narrative rather than a systematic review, screening and selection were conducted by the author(s) against these relevance and credibility criteria rather than through a pre-registered protocol, dual independent screening, or a PRISMA-style flow diagram. Epidemiological data from the WHO, CDC, and National Sleep Foundation reports supplement the primary literature. Detailed data have been retrieved and interpreted in the context of sleep hygiene, using the framework of Nidra and its physiological, psychological, and social dimensions.

3. Results

Ayurvedic Perspective of Nidra

3.1.1. Definitions of Nidra Across the Brihattrayi

Ancient pioneer physician Acharya Charaka defines Nidra (sleep) as the state arising when the Manas (mind) and Indriyas (sense organs), fatigued (klanta), withdraw from their objects of perception; as quoted: यदा तु मनसि क्लान्ते कर्मात्मानः क्लमान्विताः । विषयेभ्यो निवर्तन्ते तदा स्वपिति मानवः।। (Charaka Samhita, Sutrasthana 21/35).

Father of Surgery, Acharya Sushruta, locates the mechanism in the Hridaya (functional mind), describing sleep as arising when Tamas envelops the seat of consciousness, and Kapha fills the Manovaha Srotasa (mind)- हृदयं चेतनास्थानमुक्तं सुश्रुत! देहिनाम् । तमोभिभूते तस्मिंस्तु निद्रा विशति देहिनम् ।। निद्राहेतुस्तमः, सत्त्वं बोधने हेतुरुच्यते । स्वभाव एव वा हेतुर्गरीयान् परिकीर्त्यते ।। (Sushruta Samhita, Sharirasthana 4/34-35)

Also, Acharya Vagbhata synthesises both perspectives, identifying fatigue of the Manas (mind) and Kapha accumulation as dual precipitating causes. Together, these all definitions establish Nidra as governed by the interaction of Manas, Indriyas, Kapha, and Tamas, paralleling the two-process model of sleep regulation, wherein sleep is governed by both the homeostatic status of the body and the circadian timing. (Tripathi, 2019; Acharya et al., 2023)

3.1.2. Nidra as Trayopastambha

Acharya Charaka enumerates Nidra among the Trayopastambha. This positioning makes sleep a subject of active clinical attention, not a passive background. The physician who ignores a patient's Nidra is neglecting one of the three foundational pillars of health. (Kushwaha, 2022; Sharma et al., 2024)

3.1.3. Types of Nidra

The Brihattrayi classifies Nidra according to causation, quality, and clinical significance. Table 1 mentions the classification of Nidra as per the Brihattrayis.

Type	Charaka Samhita	Sushruta Samhita	Ashtanga Hridaya
Natural Nocturnal (Ratri)	Ratri Swabhavaprabhava-natural, circadian-aligned	Vaishnavi (Swabhavika) health-sustaining	Kalaswabhavaja arising at the right time
From Kapha/Tamas	Shleshma Samudbhava	Tamasi (Tamo Guna dominant)	Shleshmaprabhava
From Fatigue (Shrama)	Manah-Sharira Shrama Sambhava	Vaikariki (disease-associated)	Chitta/Deha-Khedodbhava
Pathological (Rogajanya)	Vyadhyanuvartini; Agantuki	Not Mentioned	Amayaja; Agantuka

Table 1: Selected Classification of Nidra According to the Brihattrayi

3.1.4. Samyak Nidra, Nidranasha, and Atinidra

Samyak (as described in Shastra) Nidra is recognised upon waking by, Laghava (lightness), Prasanna Indriya (sensory clarity), Utsaha (enthusiasm), Bala (strength), Varna (good complexion), and Sukha (well-being), mapping precisely onto modern sleep quality measures such as the Pittsburgh Sleep Quality Index (PSQI) (Tripathi, 2019; Hyndych et al., 2025; Shah et al., 2025). Nidranasha (understood as insomnia) is a type of Asamyak Nidra which arises from Vata-Pitta-Dushti (vitiation of doshas), Dhatu depletion, fear, anxiety, anger, and suppression of Tamo Guna. Acharya Sushruta prescribes Abhyanga (oil massage), Shiroabhyanga (head massage), Samvahana (kneading massage), comfortable Shayya (bedding), and dietary use of madhura and snighdha ahara (sweet and unctuous food), a protocol anticipating modern sleep hygiene with striking fidelity (Kushwaha, 2022; Sharma et al., 2024; Shastri, 2009). Atinidra (hypersomnia), also a type of Asamyak Nidra, arises from Kapha and Tamas excess, paralleling modern hypersomnolence through reduced orexin signalling and excess adenosinergic drive (Tripathi, 2019). Nidra is classified among Adharniya Vegas (urges not to be suppressed), with Vegadharana producing Jrimbha (yawning), Angamarda (pain), Tandra (lethargy), Shiroroga (medical issues of head), and Akshigaurava (heaviness in the eyes). (Sharma et al., 2024; Tripathi, 2019) This positions sleep suppression as directly pathogenic, strongly supported by modern evidence that even short-term sleep restriction produces measurable neuroendocrine, immunological, and cardiovascular consequences. (Hyndych et al., 2025; Shah et al., 2025; Denisova et al., 2024; Liu et al., 2025)

Contemporary Perspective of Sleep

3.2.1. Sleep Architecture and Circadian Regulation

Sleep comprises Non-Rapid Eye Movement sleep (NREM) (N1, N2, N3) and Rapid Eye Movement sleep (REM) stages cycling across 90-to-100-minute periods. Stage N3 (slow-wave sleep) is the most restorative, governing glymphatic clearance, Growth Hormone secretion, and immune restoration. REM sleep promotes emotional memory processing, synaptic plasticity, and cognitive integration. The progressive lengthening of REM in later cycles means the last two hours of an eight-hour sleep period are disproportionately REM-rich (Bindusree et al., 2024; Roy et al., 2026; Saper et al., 2010). The two-process model of sleep regulation in 1982 identified Process S (adenosine-mediated homeostatic drive accumulating through wakefulness) and Process C (SCN-governed circadian timing via melatonin and cortisol rhythms). Modern evening blue-light exposure from screens (460-480 nm) directly suppresses melatonin and delays circadian phase, producing social jetlag, an independent risk factor for metabolic, cardiovascular, and psychological disorders now recognized as a major pathogenic force of modernity (Bindusree et al., 2024; Roy et al., 2026; Denisova et al., 2024).

3.2.2. Epidemiology of Sleep Disorders

Approximately one-third of the global population has insomnia, with general sleep disturbance reported in 32.1% and insufficient sleep in 43.2% of populations studied. Sleep disorders cost the United States an estimated

50–100 billion dollars annually in lost productivity, and are responsible for over 100,000 road crashes and 1,550 deaths per year from drowsy driving. India ranks second globally in sleep deprivation, with the burden compounded by rapid smartphone proliferation, shift-work economies, and eroding traditional lifestyle rhythms (National Sleep Foundation, 2024; De Pasquale et al., 2024).

3.3. Physiological Importance of Nidra

Sleep is the period of most fundamental biological maintenance, restoration, and regulation. Ayurveda recognised this through Nidra as Bhutadhatri (that sustains the living beings), Pushtikara (nourishing), and Balyakara (strength-giving), while modern physiology has characterised the molecular, cellular, and systemic mechanisms through which these outcomes are achieved (Sharma et al., 2024; Shastri, 2009; World Health Organization, 2024).

3.3.1. Neural Restoration and Brain Health

The glymphatic system, astrocytic perivascular channels using CSF flow to clear neurotoxic metabolic waste, is most active during NREM Stage N3, when the brain's interstitial space expands by approximately 60%. This facilitates clearance of beta-amyloid and tau proteins, the pathological hallmarks of Alzheimer's disease. Sleep deprivation impairs glymphatic function and accelerates amyloid accumulation, establishing a mechanistic link between chronic sleep loss and neurodegenerative disease (Acharya et al., 2023; Bindusree et al., 2024). In Ayurveda terms, Nidra as Bhutadhatri, nourishing all living beings as a mother nourishes her child, precisely expresses the brain's irreplaceable dependence on sleep for its own chemical cleansing (Kushwaha, 2022; Denisova et al., 2024). Memory consolidation occurs through hippocampal replay of learning during NREM slow oscillations and sharp-wave ripples, followed by REM-dependent synaptic integration and global downscaling. Studies demonstrate that 17–19 hours of sustained wakefulness produce cognitive impairment equivalent to 0.05% blood alcohol, while 24 hours approaches 0.10%, findings Ayurveda anticipates through the concept of Dhee-Dhriti-Smriti (intellect-retention-memory) impairment from Nidranasha and Prajnaparadha (Hyndych et al., 2025; Shah et al., 2025).

3.3.2. Endocrine and Metabolic Regulation

Approximately 70-80% of daily growth hormone secretion occurs during the first episode of deep NREM sleep, governing tissue repair, protein synthesis, and Dhatu Poshana (tissue nourishment). Sleep disruption reduces GH output, producing patterns Ayurveda describes as Karshya (emaciation), Abala (weakness), and Ojavisramsa (diminution of Ojas (immunity)) (Kushwaha, 2022; Shastri, 2009; National Sleep Foundation, 2024). Even six nights of partial sleep restriction reduce insulin sensitivity by 40%, comparable to early Type-2 Diabetes, while evening cortisol elevation from sleep deprivation drives gluconeogenesis, visceral adiposity, and Agnimandya (impaired status of Agni). Leptin falls 18%, and ghrelin rises 28% after one night of partial restriction, mechanistically explaining the epidemiological association between short sleep and obesity, corresponding classically to Medas-Vriddhi and Rasa-Medas-dushti (Shastri, 2009; Bindusree et al., 2024).

3.3.3. Immune Function and Vyadhikshamatva

Slow-wave sleep enhances T-cell–antigen-presenting cell interactions, promotes cytokine secretion, and consolidates immunological memory. Individuals sleeping fewer than seven hours are nearly three times more likely to develop rhinovirus infection. Sleep-deprived individuals mount significantly weaker antibody responses to influenza and hepatitis B vaccination (Acharya et al., 2023; Bindusree et al., 2024; Shastri, 2009). Ayurveda expresses this through Ojas Dhatubala (resistance), and Vyadhikshamatva, specifically Vyadhi Utpada Pratibandhakatva (disease prevention capacity) and Vyadhi Bala Virodhitva (counteraction of established disease), both supported by Samyak Nidra and depleted by Nidranasha or Nidra-Alpata (National Sleep Foundation, 2024; Vignesh et al., 2024).

3.3.4. Cardiovascular, Reproductive, and Physical Health

Short sleep duration (fewer than six hours) is independently associated with a 20–32% increased risk of hypertension, 45% increased risk of myocardial infarction, and 15% increased risk of stroke (Shah et al., 2025; Centers for Disease Control and Prevention, 2009). A study of 300 adults with hypertension and diabetes found that 78% experienced poor sleep quality, with sleep hygiene independently predicting psychological stress, demonstrating the bidirectional relationship between sleep, cardiovascular risk, and psychological burden (Denisova et al., 2024). Reproductive health represents one of the most verifiable Ayurveda-modern convergence

points. Acharya Charaka states that Nidra confers Vrishata (fertility) while its deprivation causes Klibata (impotency or infertility). In men, one week of sleep restriction to five hours reduces testosterone by 10-15%, equivalent to ageing 10-15 years. Poor sleep is associated with reduced sperm motility and increased DNA fragmentation. In women, shift work is associated with 22% higher odds of menstrual disruption and 80% higher odds of infertility (Singh et al., 2025; Alanazi et al., 2023).

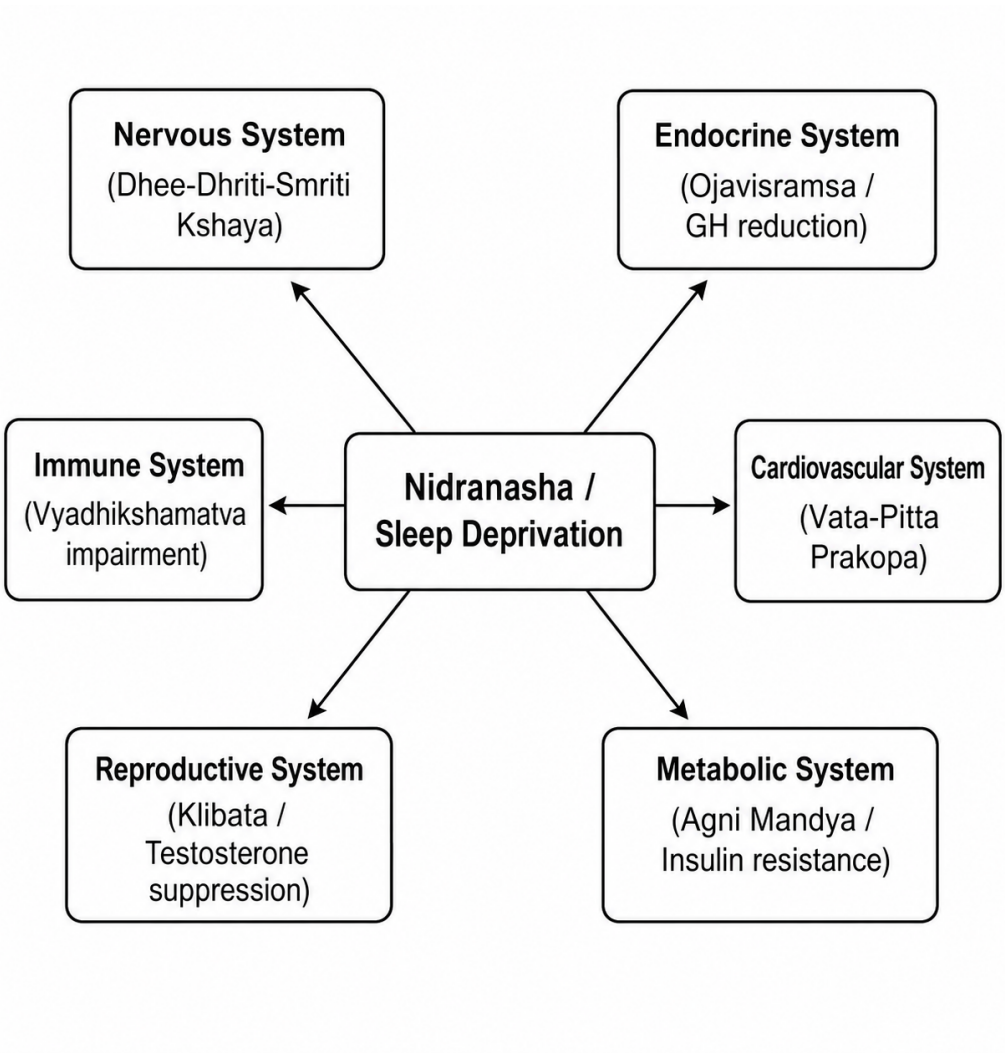


Figure 1: Bidirectional Relationship Between Sleep Deprivation and Multi-System Disease

Alt text: Diagram illustrating bidirectional relationship between sleep deprivation and various health consequences

The Classical Ayurveda Pathway: Nidranasha/Nidra-Alpata → Vata Prakopa → Shukravaha Srotodushti → Klibata Maps Precisely Onto: Sleep Deprivation → Hypothalamic-Pituitary-Adrenal Axis (HPA) Hyperactivation → Testosterone Suppression → Impaired Sperm Production. (Deshpande & Asthana, 2025)

Physical fitness and Deha Bala are mediated through GH secretion, protein synthesis, glycogen replenishment, and motor skill consolidation during sleep. A meta-analysis study established that sleep deprivation significantly impairs muscle strength, cardiovascular endurance, reaction time, and injury risk. (De Pasquale et al., 2024; Varadharasu & Das, 2024) Ayurveda identifies Samyak Nidra as the primary determinant of Yuktikrita Bala, the acquired strength enabling physical performance. (Vignesh et al., 2024)

3.4. Psychological Importance of Nidra

If the physiological importance of Nidra establishes sleep as a biological necessity, its psychological importance establishes sleep as a civilizational one. Ayurveda placed Manas at the centre of the sleep mechanism, describing Nidranasha as causing Dukkha (sorrow), Ajnana (cognitive impairment), and Manas dushti (affliction of mind) (Kushwaha, 2022; Sharma et al., 2024). Contemporary neuroscience has provided the mechanistic architecture confirming that the classical Acharyas of Ayurveda aptly stated: sleep is not the brain resting; it is the brain performing its most irreplaceable psychological work (Acharya et al., 2023; Pandi-Perumal et al., 2022).

3.4.1. Cognition, Memory, and Executive Function

Restricting sleep to six hours per night for 14 consecutive days produces cognitive impairment equivalent to 48 hours of total sleep deprivation, yet subjects subjectively normalise their impairment, failing to recognise their own functional decline. This precisely expresses Prajnaparadha in which corrupted judgment fails to recognise the harm it is causing (Sharma et al., 2024; Shastri, 2009; Tripathi, 2019). Working memory, executive planning, cognitive flexibility, and response inhibition all deteriorate, with the prefrontal cortex showing disproportionate vulnerability. Sleep-deprived individuals make greater risk-seeking decisions with reduced sensitivity to negative outcomes, behavioural expression of Dhee-Dhriti-Smriti vitiation (Kushwaha, 2022; Shastri, 2009; Tripathi, 2019). For students and medical professionals, sleep is not time stolen from studying; it is the biological process through which studying becomes learning. NREM sleep replays hippocampal learning patterns for neocortical transfer; REM sleep integrates and prunes synaptic networks (Besedovsky et al., 2012; Bindusree et al., 2024; Saper et al., 2010).

3.4.2. Emotional Regulation

One night of sleep deprivation produces a 60% increase in amygdala reactivity to negative stimuli, accompanied by functional disconnection between the amygdala and medial prefrontal cortex, the neural substrate of emotional inhibition and contextual appraisal (Acharya et al., 2023). The sleep-deprived brain reacts to emotional stimuli with greater intensity and less regulatory capacity, the neurobiological equivalent of driving at speed with impaired brakes. Ayurveda describes this as Raja-Tama Vriddhi (increased status of rajas and tamas) and Sattva Kshaya(depleted status of sattva), the depletion of mental clarity and equanimity that proper Nidra preserves. REM sleep allows emotionally charged memories to be reprocessed in an environment of reduced norepinephrine, enabling the brain to integrate difficult experiences without their original neurochemical sting. REM deprivation, which disproportionately occurs when sleep is curtailed in the early morning hours, specifically impairs the brain's capacity to process trauma and grief, contributing to the development of PTSD, depression, and anxiety (Acharya et al., 2023; Bindusree et al., 2024; Pandi-Perumal et al., 2022).

3.4.3. Mental Health, Stress, and Well-Being

Individuals with insomnia symptoms are three times more likely to develop clinical depression within 12 months than those without, with sleep disruption preceding depression onset in most longitudinal studies, establishing poor sleep as a primary risk factor, not merely a symptom (National Sleep Foundation, 2024; Roy et al., 2026). A Study identified rumination (as mentioned by Chinta in Ayurveda), social anxiety, emotion-focused coping, and smartphone dependence (Asatmendriyartha Samyoga - Indriya Atiyoga) as the strongest mediating pathways through which stress impairs sleep, each targetable through both modern psychological intervention and classical Ayurvedic conduct (Shah et al., 2025). Also, another study found that poor sleep hygiene was independently associated with significantly higher psychological stress, even after controlling for sleep quality, with feeling unsafe at night as the strongest predictor, demonstrating that environmental sleep hygiene factors are active determinants of psychological burden (Alanazi et al., 2023; Varadharasu & Das, 2024; Denisova et al., 2024; Zhang et al., 2024).

3.4.4. Yoga Nidra

Yoga Nidra, a technique of systematic conscious relaxation bridging wakefulness and deep sleep, has accumulated substantial RCT evidence. An RCT in chronic insomnia patients demonstrated significant improvements in Stage N2 and N3 sleep and a significant drop in salivary cortisol (Pandi-Perumal et al., 2022). In a separate, small neuroimaging study, Kjaer et al. (2002) used ^{11}C-raclopride PET in eight experienced practitioners and reported a 65% increase in endogenous striatal dopamine release during Yoga Nidra practice, inferred from a 7.9% reduction in raclopride binding potential in the ventral striatum; as a non-clinical, small-sample PET study, this finding should be read as mechanistic evidence of a neurochemical correlate, not as a clinical effect size. Broader RCT evidence demonstrates reductions in stress, anxiety, depression, and blood pressure with Yoga Nidra practice, and its accessible supine format requiring no equipment makes it among the most practically scalable integrative sleep interventions available (Pandi-Perumal et al., 2022).

3.5. Social Importance of Nidra

The social consequences of inadequate Nidra extend far beyond the individual, affecting families, institutions, economies, and public safety. Ayurveda frames civilisation-scale sleep disruption as Prajnaparadha of knowingly undermining one of the three pillars of biological life.

3.5.1. Academic and Occupational Performance

Sleep deprivation impairs memory consolidation, sustained attention, and executive function upon which academic and occupational performance depend. A study found that 84.4% of college students qualified as poor sleepers (PSQI > 5), with sleep hygiene directly and indirectly predicting GPA and psychological well-being (Hyndych et al., 2025; Singh et al., 2025). Acharya Charaka's description of Samyak Nidra as conferring Jnana (knowledge) and Nidranasha as producing Ajnana (ignorance) anticipates the full scale of academic consequence documented in modern literature (Kushwaha, 2022). Economically, sleep disorders cost the United States an estimated $50–100 billion annually in lost productivity, absenteeism, and healthcare burden (National Sleep Foundation, 2024). Sleep-deprived physicians, medical residents averaging fewer than five hours of sleep on call, show measurably impaired clinical judgment and increased medical error rates, a public safety crisis with direct ethical dimensions (National Sleep Foundation, 2024; Roy et al., 2026; Chopra & Sharma, 2020).

3.5.2. Public Safety, Family, and Social Fabric

At least 100,000 road crashes, 71,000 injuries, and 1,550 deaths are attributed annually to drowsy driving in the United States alone. Historically, sleep-deprivation-related impaired judgment has contributed to major industrial and transportation disasters, establishing inadequate Nidra as a genuine public safety threat (National Sleep Foundation, 2024). The relational consequences of sleep deprivation are equally significant. Sleep loss reduces empathy, increases irritability, impairs parenting quality, and reduces prosocial behaviour, systematically eroding the relational fabric that Ayurveda regards as the social expression of Sukha and Dharma. Children of sleep-deprived parents show measurable developmental consequences, extending the social cost of Nidranasha across generations (Acharya et al., 2023; Shah et al., 2025; Borbely, 1982).

3.5.3. Modern Pathogenic Forces

Shift workers, comprising 15–20% of the workforce, face chronic circadian misalignment associated with increased cardiovascular disease, metabolic syndrome, and depression: the modern expression of Ratrijagarana-induced Vata-Pitta Prakopa and Dinacharya disruption. An AIIMS Bhopal study documented significant associations between poor sleep hygiene practices and mood impairment in Indian school-going adolescents, underscoring the urgency of sleep hygiene education in Indian school curricula (Roy et al., 2026). Socioeconomic disparities in sleep health add a further dimension. Another study in low-socioeconomic status adults found safety-related fears as the primary driver of poor sleep quality, aligning precisely with the Ayurvedic recognition that Abhaya (freedom from fear) and Asukha Shayya (uncomfortable sleeping conditions) are causes of Nidranasha. A truly integrative approach to sleep health must address not only individual behaviours but the social and environmental conditions that make restorative sleep possible or impossible (Singh et al., 2025; Vignesh et al., 2024).

3.6. Sleep Hygiene Practices: Contemporary, Ayurveda, and Integrative Perspectives

Sleep hygiene translates theoretical understanding of sleep's importance into concrete daily practices that protect restorative sleep. A 2024 Study in Sleep Medicine Reviews examined 548 studies and identified three constitutive thematic clusters: behavioural factors (timing, substance use, pre-sleep activity), environmental factors (light, noise, temperature), and the individual's capacity for modification. All three clusters are explicitly addressed in classical Ayurveda frameworks, reflecting the fact that both traditions grapple with the same fundamental problem, which is protecting sleep from the behavioural and environmental disruptions to which we humans are continually exposed (Shastri, 2009; Deshpande & Asthana, 2025).

3.6.1. Modern Sleep Hygiene Practices

Sleep hygiene is recognised as the non-pharmacological first line of intervention for sleep problems and forms the foundational behavioural component of CBT-I, the first-line treatment for chronic insomnia endorsed by the American College of Physicians and the American Academy of Sleep Medicine. Technology-enhanced CBT-I incorporating gamified sleep hygiene reduced insomnia severity by 40% over six weeks; AI sleep coaching improved sleep efficiency by 20% over 30 days (Alanazi et al., 2023; Sharma et al., 2024). Core evidence-based components include: fixed sleep-wake timing (strengthening circadian amplitude and sleep efficiency); screen-free and dim-light periods 1–2 hours before bed (melatonin preservation); caffeine avoidance 4–6 hours before sleep (adenosine receptor restoration); alcohol avoidance within 3 hours (preventing REM suppression); cool, dark, quiet sleeping environment (18–20°C, facilitating core temperature drop); regular moderate exercise not within 2–3 hours of bedtime; 30–60 minute pre-sleep wind-down involving relaxation practices; and brief early-

afternoon naps not exceeding 20 minutes (Acharya et al., 2023). The Alanazi et al. cross-sectional study of 384 adults found significant associations between poor sleep hygiene and sleep problems (76.5% vs 56.1%, $p < 0.001$), with screen use as a major behavioural factor (Besedovsky et al., 2012; National Sleep Foundation, 2024).

3.6.2. Ayurvedic Sleep Hygiene Practices

Dinacharya (daily regimen) is the classical framework within which Nidra-preserving conduct is embedded. Brahma Muhurta waking, approximately 1.5 hours before sunrise, parallels the pre-awakening rise in cortisol described in chronobiology. The precise timing and amplitude of this rise vary with individual chronotype, latitude, and season, so this is best understood as an observed correspondence between a classical practice and a general circadian pattern rather than a fixed physiological equivalence; consistent early waking is nonetheless recognised as one of several practices that can support Process C entrainment. Abhyanga is prescribed for its Vatahara and Balya (strengthening) effects. Modern evidence confirms that oil massage increases serotonin and dopamine, reduces cortisol, and activates the parasympathetic nervous system. Pada-abhyanga (foot massage) specifically facilitates the peripheral vasodilation that enables the core body temperature drop required for sleep onset (Shastri, 2009; Shah et al., 2025). Ratricharya prescribes: Laghu Ahara (light meal) consumed well before sleep; application of Shiroabhyanga, Pada abhyanga, and Karna abhyanga (body massages); avoiding Vata-Pitta aggravating substances; avoiding intense intellectual activity and emotionally disturbing experiences pre-sleep; sleeping on a Sukha Shayya (comfort bedding) with a settled mind (Tripathi, 2019). The Ushna Kshirapana (warm milk) recommendation reflects classical understanding of milk's sleep-promoting tryptophan, calcium, and bioactive peptides validated by modern nutritional sleep science as melatonin synthesis precursors (Xie et al., 2013; Shah et al., 2025).

Body System	Modern Evidence	Ayurveda Correlate
Nervous System	Impaired attention, memory, executive function; amyloid accumulation; glymphatic failure	Dhee-Dhriti-Smriti kshaya, Prajnaparadha, Manas vitiation
Endocrine System	Reduced GH; cortisol elevation; insulin resistance; leptin/ghrelin dysregulation	Dhatu Aposhana, Agni Mandya, Ojavisramsa
Immune System	Reduced NK cell activity; impaired T-cell function; poor vaccine response	Ojas Kshaya, Bala Kshaya, Vyadhikshamatva impairment
Cardiovascular System	Hypertension; increased MI/stroke risk; arrhythmia	Vata-Pitta Prakopa, Hridaya-Dushti
Metabolic System	Obesity; type 2 diabetes; dyslipidemia	Meda Vriddhi, Agni Mandya, Rasa-Rakta dushti
Reproductive System	Reduced testosterone; poor sperm quality; anovulation; infertility	Klibata, Shukra Kshaya, Artava dushti
Musculoskeletal System	Reduced muscle recovery; impaired protein synthesis	Bala Kshaya, Mamsa-Asthi Dhatu-kshaya

Table 2: Physiological Effects of Sleep Deprivation

Domain	Modern Evidence	Ayurvedic Correlate
Sustained Attention	PVT lapses; subjective normalisation of impairment	Dhee-kshaya, Prajnaparadha
Working Memory	Phonological and visuospatial impairment	Smriti kshaya
Executive Function	Impaired planning, flexibility, and inhibition	Dhriti kshaya, Manas vitiation
Emotional Regulation	60% amygdala hyperreactivity; prefrontal disconnection	Raja-Tama Vriddhi, Satva Kshaya
Depression Risk	3 times increased risk with insomnia (meta-analytic)	Dukkha, Manas Dushti

Domain	Modern Evidence	Ayurvedic Correlate
Anxiety and Stress	Elevated cortisol; HPA hyperactivation; rumination	Chinta-janya Nidranasha, Vata-Pitta Prakopa
Well-Being	Reduced SWB across psychological, physical, and relational domains	Sukha Kshaya, Tushti impairment

Table 3: Psychological Effects of Sleep Deprivation: Ayurvedic and Modern Correlates

3.6.3. Integrative Nidra-Preserving Protocol

The convergence between modern sleep hygiene science and Ayurveda sleep-promoting practices is sufficiently deep to support an integrated, evidence-grounded daily protocol. Its architectural principle: Nidra is a consequence of the entire day's conduct, built through 24-hour behavioural consistency, a principle Ayurveda expresses through Dinacharya and modern sleep medicine expresses through sleep drive architecture. Table 4 presents an Integrative Nidra-Preserving Protocol focusing on the physiological, psychological, and social importance of Nidra in the modern era, with particular emphasis on sleep hygiene practices.

Time	Practice	Ayurvedic Basis	Modern Mechanism
Dawn	Consistent early waking; avoid abrupt alarm-driven arousal	Brahma Muhurta; Dinacharya	Circadian cortisol peak alignment; Process C strengthening
Morning	20–30 min natural light; Surya Namaskar or outdoor activity	Atapa Sevana; Vyayama	SCN photic entrainment; melatonin timing calibration
Morning	Abhyanga before bath	AH Su. 2/8; Vatahara; Balya	Parasympathetic activation; cortisol reduction; serotonin increase
Daytime	Avoid daytime sleep (except Grishma Ritu)	Divaswapna Nishedha; CS Su. 21/39	Homeostatic sleep pressure (Process S) preservation
Afternoon	Moderate exercise; no vigorous exercise after 6 PM	Vyayama; Bala Vardhana	Slow-wave sleep enhancement; adenosine drive increase
Evening	Light dinner 2–3 hrs before sleep; avoid heavy/spicy foods	Ratricharya; Laghu Ahara	Reduced digestive arousal; core temperature regulation
Evening	Avoid caffeine, alcohol, and nicotine	Avoid Vata-Pitta aggravating substances	Adenosine receptor availability; REM architecture preservation
Pre-sleep 1hr	Screen-free; dim lighting	Indriya Nigraha	Melatonin secretion initiation; circadian phase protection
Pre-sleep 30 min	Yoga Nidra or Pranayama	Pratyahara; Ratricharya	Parasympathetic dominance; cortisol reduction; dopamine release
Pre-sleep 15 min	Pada-abhyanga with warm oil	Sushruta's Nidranasha Chikitsa	Core body temperature drops via peripheral vasodilation
Bedtime	Consistent sleep time; Sukha Shayya; left-lateral preferred	Samyak Nidra; Kala Nidra; Ratricharya	Process S and C convergence; parasympathetic consolidation
Sleep environment	Dark, cool 18–20°C, quiet; blackout curtains	Asukha Shayya as Nidranasha cause	Melatonin maintenance; arousal suppression; SWS optimisation
Morning after	Do not suppress waking urge; assess Samyak Nidra Lakshana	Adharniya Vega; Laghava upon waking	Circadian anchor maintenance; cortisol peak alignment

Table 4: Integrative Nidra-Preserving Protocol – Classical and Modern Synthesis

4. Discussion

4.1. The Depth of Convergence

The convergence between Ayurveda and modern understandings of sleep runs deeper than surface-level analogies. Both traditions understand sleep as a time-dependent restorative process that cannot be compressed or deferred without cost. Both identify disruption of sleep as a generative, multi-system cause of disease. Both identify the primary drivers of disruption as behavioural and environmental factors within human control. Both regard sleep as a domain of preventive intervention (Shastri, 2009; Saper et al., 2010). This structural parallel is most visible in the Trayopastambha, when Charaka placed Nidra alongside Ahara and Brahmacharya as a pillar of life; he made the same systems-level claim that modern preventive medicine, through decades of independent epidemiological research, has arrived at: that health maintenance requires simultaneous regulation of nutrition, rest, and conduct (Kushwaha, 2022). The most mechanistically specific convergence is the reproductive pathway: Nidranasha → Vata Prakopa → Shukravaha Srotodushti → Klibata maps precisely onto sleep deprivation → HPA hyperactivation → testosterone suppression → impaired sperm production (Bindusree et al., 2024; National Sleep Foundation, 2024).

4.2. Where Ayurveda Anticipated Modern Science

Several Ayurveda observations constitute genuine anticipations rather than post-hoc parallels. Waking during Brahma Muhurta (approximately 96 minutes before sunrise) coincides broadly with the pre-awakening cortisol rise described by chronobiology. Because the exact timing and magnitude of this rise vary by individual chronotype, geographic latitude, and season, the relationship is best framed as an interpretive parallel between classical observation and circadian physiology rather than a precise mechanistic equivalence. Consistent early waking is nonetheless recognised by chronobiology as one of several behavioural practices that can help strengthen circadian amplitude (Chopra & Sharma, 2020; Borbely, 1982). Pada-abhyanga and Abhyanga's sleep-promoting effects operate through peripheral vasodilation, facilitating core temperature drop, a mechanism classical texts did not articulate but correctly identified clinically. Seasonal contraindication of Divaswapna (day-sleep), except in Grishma (summers), anticipates chronobiology's understanding of photoperiod-dependent optimal nap timing in tropical climates. The Chinta-Bhaya-Krodha-Shoka (worry-fear-anger-grief) enumeration as causes of Nidranasha supports the concept of a pathway through which stress impairs sleep. (Peach et al., 2016; Zhang et al., 2024; Liu et al., 2025)

4.3. Where the Systems Diverge?

Modern sleep science is mechanistic and reductionist, seeking explanation through molecular pathways and quantifiable parameters. Ayurveda is holistic and teleological, understanding sleep through Purusha, Prakriti and Dharma. These are not merely different descriptions of the same reality; they are different epistemological approaches with different clinical emphases and different clinician-patient relationships. The Ayurvedic typology of Nidra does not map neatly onto modern sleep stage architecture. The Svabhavika-Vaikariki distinction captures a clinically important qualitative difference but lacks the granularity of polysomnography needed to diagnose obstructive sleep apnoea, restless legs syndrome, or REM sleep behaviour disorder, conditions requiring objective measurement. This is not a failure of Ayurveda but a recognition that classical and modern diagnostic tools operate at complementary levels (Deshpande & Asthana, 2025; World Health Organization, 2024). The evidence base for Ayurvedic sleep interventions varies considerably. Yoga Nidra has substantial RCT evidence. Dietary recommendations are broadly consistent with modern nutritional sleep science but await rigorous Ayurveda formulation trials. Abhyanga's sleep-promoting effects are supported by analogous massage therapy research but require specifically designed Ayurveda trials. This evidence quality gradient must be honestly acknowledged in any integrative clinical framework.

4.4. The Modern Era as a Pathogenic Environment for Nidra

The modern environment disrupts Nidra through simultaneous mechanisms: artificial light extends the biological night into social day; digital entertainment creates unprecedented pre-sleep cognitive and emotional arousal; occupational pressures incentivise sleep sacrifice; the food environment promotes stimulant-laden, heavy evening diets; and a social culture validates and celebrates sleeplessness. These disruptions collectively constitute a civilisation-scale Prajnaparadha (faulty habits and practices) (Varadharasu & Das, 2024; Pandi-Perumal et al., 2022). The Shah et al. umbrella review of 29 meta-analyses established U-shaped all-cause mortality risk with both

short (< 7 hours) and long (> 9 hours) sleep, with significant cardiovascular, metabolic, and mental health consequences persisting after controlling for established risk factors - establishing sleep deprivation as an independent, modifiable risk factor for premature mortality (Shah et al., 2025). India's position as the second most sleep-deprived nation globally, combined with rapid digitalisation and erosion of traditional lifestyle rhythms, creates a public health imperative to the Ayurveda framework is uniquely positioned to address (Pandi-Perumal et al., 2022; Singh et al., 2025; Alanazi et al., 2023).

4.5. Future Research Directions

Three priority research directions emerge from this analysis. First, Prakriti-stratified sleep research: if constitutional types (Vata, Pitta, Kapha predominant) have genuinely different sleep architectures and disorder vulnerabilities, as classical theory predicts, then Prakriti could function as a clinically useful predictor of sleep disorder risk and treatment response, testable through polysomnography in constitutionally characterised cohorts (Varadharasu & Das, 2024; Correia et al., 2024). Second, rigorous clinical trials of Ayurvedic sleep interventions including standardised Abhyanga protocols, Ratricharya counselling with fidelity monitoring, and dietary interventions based on classical Nidranasha Chikitsa, building an evidence base meeting modern standards while validating classical practice. Third, population-level Dinacharya-based sleep hygiene programs in Indian schools, workplaces, and community settings, an urgent public health research priority given India's deteriorating national sleep health.

4.6. Limitations

This review has several limitations. First, it is a narrative review rather than a systematic one, making it susceptible to selection bias since sources were chosen for relevance and credibility without a formal search protocol or quality appraisal. Second, the proposed Nidra-Preserving Protocol has not been empirically tested as a combined intervention; it merges Dinacharya/Ratricharya elements with evidence-based sleep hygiene practices, but the evidence supporting these practices varies widely. Clinical trials of the combined protocol are necessary before any efficacy claims can be made. Third, the modern-classical parallels drawn, such as the Brahma Muhurta–cortisol correspondence, are interpretive rather than mechanistically established. Finally, this paper does not present original primary data, and its conclusions should be viewed as hypothesis-generating rather than direct clinical recommendations.

5. Conclusion

Acharya Charaka stated that happiness, sorrow, strength, knowledge, and life itself all depend on Nidra (sleep). This assertion, over two thousand years old, is supported by modern biomedical evidence. The paper integrates classical Ayurveda with contemporary research, confirming that Nidra is essential for various physiological functions and aligns with concepts like Dhatu-Poshana and Ojas. Additionally, sleep has profound psychological implications for cognition and mental health, which is especially urgent in today's context.

The social consequences of neglecting sleep impact individuals, families, and economies, representing what this discussion frames as a significant intellectual failing in prioritising health. The key takeaway is that classical Ayurveda and modern sleep science are complementary rather than competing. Together, they provide a more comprehensive understanding of sleep, emphasising its crucial role in preventive medicine and public health. Acting on these insights is vital for addressing the health challenges of the twenty-first century: without sleep, the biological, psychological, and social foundations of life cannot endure.

Abbreviations

CS: Charaka Samhita; AH Su.: Ashtanga Hridayam Sutrasthana; NREM: Non-Rapid Eye Movement; REM: Rapid Eye Movement; N1: NREM Sleep Stage 1; N2: NREM Sleep Stage 2; N3: NREM Sleep Stage 3; SCN: Suprachiasmatic Nucleus; CSF: Cerebrospinal Fluid; GH: Growth Hormone; NK: Natural Killer cells; HPA: Hypothalamic-Pituitary-Adrenal Axis; PTSD: Post-Traumatic Stress Disorder; CBT-I: Cognitive Behavioural Therapy for Insomnia; RCT: Randomised Controlled Trial; GPA: Grade Point Average; PSQI: Pittsburgh Sleep Quality Index; PVT: Psychomotor Vigilance Task; MI: Myocardial Infarction; DNA: Deoxyribonucleic Acid; WHO: World Health Organization; CDC: Centers for Disease Control and Prevention; NSF: National Sleep Foundation; AIIMS: All India Institute of Medical Sciences; AI: Artificial Intelligence; SWS: Slow-Wave Sleep; SWB: Subjective Well-Being

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About the authors

Vaibhav Shukla. Vaibhav Shukla is an Ayurvedacharya (BAMS) Final Professional Scholar from Shri BM Kankanawadi Ayurveda Mahavidyalaya, PG Studies & Research Centre, KLE Academy of Higher Education & Research (Deemed-to-be-University), Belagavi, who is passionate about fundamental research in Ayurveda and Integrative Medicine, developing new-age solutions. A recipient of the Dr Prakash Mangalaserri Memorial National Award 2025, he has authored multiple indexed articles, including Web of Science or Scopus indexed along with one book published to his credit.

Pankaj Sharma. Pankaj Sharma is a Junior Resident in the Department of Rejuvenative and Reproductive Medicine in Ayurveda, Shri BM Kankanawadi Ayurveda Mahavidyalaya, PG Studies & Research Centre, KLE Academy of Higher Education & Research (Deemed-to-be-University), Belagavi. He has authored numerous Scopus, Embase, and Web of Science-indexed publications, along with four books and book chapters. His research interests include Ayurveda psychotherapy and Rasayana-based disease modulation, with several notable publications in these areas. He has also reviewed 50+ manuscripts for nationally and internationally indexed journals.