

NASA HI SHIRASO DWARAM: A CONCEPTUAL REFRAMING OF KSHEERABALA TAILA NASYA IN ANIDRA (INSOMNIA) THROUGH THE MODERN NOSE-TO-BRAIN DELIVERY PARADIGM

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Article Received on 05 Sept. 2026,
Article Revised on 25 Sept. 2026,
Article Published on 01 Oct. 2026,
<https://doi.org/10.5281/zenodo.23118133>

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How to cite this Article: Dr. Sanjana Mogre^{1*}, Dr. Rajeev Kumar Pandey², Dr. Divya Gupta³ (2026). Nasa Hi Shiraso Dwaram: A Conceptual Reframing of Ksheerabala Taila Nasya In Anidra (Insomnia) Through The Modern Nose-To-Brain Delivery Paradigm. World Journal of Pharmaceutical Research, 15(19), 894–904. This work is licensed under Creative Commons Attribution 4.0 International license.

ABSTRACT

Background: *Nasya*, the nasal administration of medicated substances, is among the *Panchakarma* procedures indicated for *Anidra* (insomnia), a *Vata*-predominant disorder. Its classical rationale rests on the dictum *Nasa hi shiraso dwaram* (“the nose is the doorway to the head”) and on the *Śṛṅgāṭaka Marma*, a vital confluence linking the nasal passages to intracranial structures. *Ksheerabala Taila*, a milk- and sesame-oil-processed preparation of *Bala* (*Sida cordifolia*), is traditionally employed as *Brimhana Nasya* in *Nidranāśa*.

Objective and hypothesis: This conceptual review examines whether the classical account of *Nasya* in *Anidra* corresponds to the modern nose-to-brain delivery pathway. It advances the hypothesis that *Ksheerabala Taila Nasya* functions, in part, as a lipophilic nose-to-brain delivery system, conveying centrally active, *Vata*-pacifying constituents of *Bala* to sleep-regulating centres. **Methods:** Classical Ayurvedic texts and contemporary

pharmaceutical, neuroscientific, and clinical literature were reviewed and synthesised conceptually. **Synthesis:** Modern pharmaceutics demonstrates that intranasally administered agents can reach the central nervous system directly via the olfactory and trigeminal nerves,

bypassing the blood-brain barrier. Lipid-based vehicles enhance this transport; sesame oil is one such vehicle. *Bala* contains centrally active phytoconstituents and exhibits CNS-depressant and monoamine-modulating activity in experimental models. Preliminary clinical reports of *Ksheerabala Taila* and other *Nasya* therapies in insomnia are encouraging but limited. **Conclusion:** The classical logic of *Nasya* anticipates, in its own idiom, the modern nose-to-brain paradigm. The proposed mechanism remains a hypothesis, not an established fact, and delineates a clear experimental agenda for future research on the therapeutic potential and neurobiological basis of *Nasya*.

KEYWORDS: *Anidra*; Insomnia; *Nasya*; *Ksheerabala Taila*; *Bala (Sida cordifolia)*; nose-to-brain delivery; *Panchakarma*.

1. INTRODUCTION

Anidra (insomnia) is delineated in Ayurveda as a disorder predominantly arising from *Vata* imbalance within the *Manovaha Srotas*, and its management accords special emphasis to external therapies directed at the head.^[1] Among these, *Nasya* (the instillation of medicated oils or other substances through the nostrils) holds a distinctive position, since Ayurveda considers the nasal route a direct gateway to the *Śiras* (head) and its structures. The guiding dictum, *Nasa hi śirasas dvāram* (“the nose is the doorway to the head”), affirms that medicines administered via this route act upon intracranial tissues.^[2]

Modern pharmaceutical science has, over the last two decades, arrived independently at a strikingly similar idea. The blood-brain barrier excludes most systemically administered drugs from the central nervous system, and one of the few ways to circumvent it non-invasively is the intranasal, or “nose-to-brain”, route, in which drug reaches the brain directly along the olfactory and trigeminal nerves that terminate in the upper nasal cavity.^[3]

Despite these convergences, the classical qualitative account and the contemporary mechanistic framework have rarely been juxtaposed for a specific, widely utilized Ayurvedic preparation. The present review examines the rationale for *Ksheerabala Taila Nasya* in *Anidra*, with particular emphasis on the mechanism of nasal drug administration and its possible role in relieving the symptoms of insomnia. This conceptual review situates the classical rationale of *Nasya* within the modern nose-to-brain paradigm, delineates their correspondences, and advances a testable hypothesis regarding the mode of action of

Ksheerabala Taila Nasya in *Anidra*. Importantly, the proposal is articulated as a hypothesis to guide future research rather than as a definitive mechanism.

2. METHODS

This work is designed as a conceptual, narrative review. Classical sources were consulted from the *Bṛhat-trayi*, namely the *Charaka Saṃhitā*, *Suśruta Saṃhitā*, and *Aṣṭāṅga Hṛdaya*, together with the *Marma* literature of the *Suśruta Saṃhitā* and the *Sahasrayogam* for the formulation of *Ksheerabala Taila*.

Contemporary material was identified through systematic searches of PubMed, Google Scholar, and AYUSH repositories. The search strategy focused on literature concerning intranasal and nose-to-brain drug delivery, the neuropharmacology of *Sida cordifolia* (*Bala*), and clinical studies of *Nasya* in *Anidra* (insomnia). Keywords included “*Nasya*,” “nose-to-brain,” “intranasal delivery,” “*Sida cordifolia*,” “*Bala*,” “*Ksheerabala*,” and “*Anidra*/insomnia.”

All retrieved sources were critically synthesized to construct and evaluate a mechanistic hypothesis. Each citation was verified against its original record prior to inclusion.

3. *Anidra* and the classical logic of *Nasya*

In Ayurvedic pathology, *Anidra* (insomnia) is primarily attributed to aggravated *Vata* disturbing the mind and its channels, with therapy directed toward pacifying *Vata* and stabilizing the *Manovaha Srotas*.^[1] *Nasya* is recommended for disorders occurring above the clavicle (*Ūrdhvajatrugata Vikāra*), which includes the sleep-regulating functions of the head. The rationale is both anatomical and pharmacological: the nasal passages communicate directly with the interior of the *Śīras* (head), allowing medicines administered intranasally to act upon intracranial structures.^[2]

This communication is localized, in classical anatomy, to the *Śṛṅgātaka Marma*, a *Śīrā Marma* described by *Suśruta* as the confluence of vessels supplying the nose, eyes, ears, and tongue.^[4] It is regarded as a vital seat whose stimulation influences the entire head. A drug reaching the *Śṛṅgātaka* is believed to spread to the *Śīras* and thereby affect the mind and senses. For *Nidranāśa* specifically, *Brimhana* (nourishing) *Nasya* is preferred, since the disorder involves *Vata* aggravation and *Dhātu* depletion, particularly in the elderly. The

nourishing, *Vata*-pacifying oils used in this therapy aim to replenish and calm rather than to cleanse.^[1,5]

The procedure itself is standardized into preparatory (*Pūrva*), main (*Pradhāna*), and post-procedural (*Paśhcāt*) stages. During administration, the medicated oil is instilled in a defined dose into each nostril while the patient's head is maintained in slight extension.^[6]

4. Ksheerabala Taila: Composition and Rationale

Ksheerabala Taila, as described in the *Sahasrayogam*, is prepared by processing the root of *Bala* (*Sida cordifolia*) with *Kṣheera* (milk) and *Tila Taila* (sesame oil).^[7] Each ingredient is selected for its ability to counteract the *Vāta* pathology underlying *Anidra* (Table 1). *Bala* is traditionally classified as *Bālya* (strength-promoting), *Bṛmhaṇīya* (nourishing), *Vātahara* (pacifying *Vāta*), and *Medhya* (supportive of mental faculties), and is recognized among the foremost *Vāta*-pacifying and rejuvenating drugs.^[8]

Kṣheera is characterized by *Madhura* (sweet), *Snigdha* (unctuous), and *Śīta* (cooling) qualities, which pacify both *Vāta* and *Pitta* while providing a nutritive lipid-protein matrix. *Tila Taila* itself is *Vātahara* and *Snigdha*, and is esteemed as a *Yogavāhī* (potentiating carrier) and *Sūkṣma* (subtle, penetrating) medium. These attributes enable it to transport the properties of the processed drug into deeper tissues, a classical description of an effective therapeutic vehicle.

Table 1: Ksheerabala Taila: Constituents and their Classical and Reported Modern Actions.

Ingredient (botanical)	Classical properties / action	Reported modern actions
Bala root (<i>Sida cordifolia</i>)	Balya, Brimhaniya, Vatahara, Medhya, Rasayana	CNS-depressant activity; monoamine modulation; alkaloids (ephedrine, pseudoephedrine, vasicinone), phytosterols
Ksheera (cow milk)	Madhura, Snigdha, Sheeta; Vata-Pitta shamana, Brimhana	Nutrient lipid-protein matrix; source of tryptophan, precursor of serotonin and melatonin
Tila Taila (<i>Sesamum indicum</i>)	Vatahara, Snigdha, Sukshma, Yogavahi (vehicle)	Lipid vehicle enhancing transport of lipophilic compounds; antioxidant lignans

5. The Modern Nose-to-Brain Pathway

The blood-brain barrier (BBB) is a highly selective physiological interface that restricts the passage of most systemically administered molecules into the central nervous system (CNS),

creating a major challenge in the treatment of neurological and psychiatric disorders.^[9] Conventional oral or parenteral routes often fail to achieve therapeutic concentrations in the brain, which has driven the search for alternative strategies.

The intranasal route has emerged as a promising non-invasive pathway to bypass the BBB. The olfactory epithelium and trigeminal nerve endings in the upper nasal cavity maintain direct anatomical continuity with the CNS, allowing drugs deposited in this region to be transported along these neural pathways into the brain (Figure 1). This mechanism avoids systemic circulation, hepatic first-pass metabolism, and the restrictive endothelial junctions of the BBB.^[10,11]

The efficiency of nose-to-brain transport depends largely on the physicochemical properties of the formulation. Lipophilic molecules demonstrate superior permeability across the nasal mucosa compared with hydrophilic compounds. Lipid-based carriers, such as oils, nanoemulsions, liposomes, and solid lipid nanoparticles, have therefore been extensively studied to enhance absorption and facilitate direct brain targeting.^[12] These systems improve solubility, stability, and exploit the natural affinity of lipid molecules for neuronal membranes, thereby accelerating transport.

Recent advances in nanotechnology have introduced stimuli-responsive gels, mucoadhesive polymers, and nanoparticle-based formulations designed to prolong residence time in the nasal cavity, protect drugs from enzymatic degradation, and ensure sustained release. Such innovations have significantly improved the bioavailability of CNS-active compounds delivered intranasally.^[3]

Importantly, nose-to-brain delivery has progressed from concept to clinical application. FDA-approved intranasal products already exist for migraine and acute seizures, and intranasal therapies have been tested in clinical trials for Alzheimer's disease, Parkinson's disease and other neurological disorders, underscoring the translational potential of this route.^[13,14,15]

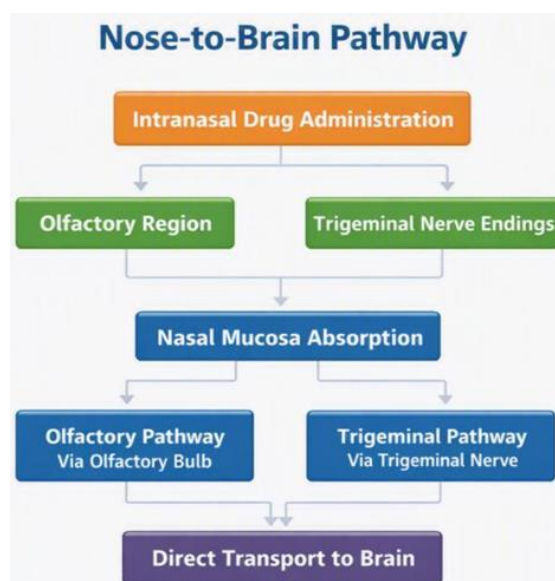


Figure 1: Nose-to-brain Pathway after Intranasal Drug Administration (Schematic).

6. Points of Convergence

Placed side by side, the classical and contemporary perspectives reveal striking correspondences. The dictum *Nāsā hi śirasō dvāram* (“the nose is the gateway to the head”) is essentially a qualitative articulation of the modern nose-to-brain axis. The *Śṛṅgāṭaka Marma*, described as the junction of channels serving the nose and the sensory organs of the upper facial region, aligns closely with the olfactory and trigeminal neural convergence that current anatomy locates in the superior nasal cavity, recognised as the substrate for direct nasal-central transport. Likewise, the classical use of *Sneha* (oil) as the medium for *Brimhana Nasya* corresponds to the modern observation that lipid-based vehicles facilitate efficient transport; sesame oil exemplifies precisely such a medium.^[3,16] These correspondences are summarised in Table 2.

Table 2: Proposed Correspondences between the Classical Account of Nasya and the Modern Nose-to-Brain Paradigm.

Classical Ayurvedic concept	Proposed modern correlate
Nasa hi shiraso dwaram (the nose is the doorway to the head)	The nose-to-brain axis: direct nasal access to the central nervous system
Shringataka Marma (confluence of the Siras of nose, eyes, ears and tongue)	Olfactory and trigeminal neural convergence in the upper nasal cavity
Drug spreads from the nasal Siras to the Shiras	Olfactory and trigeminal nerve transport bypassing the blood-brain barrier
Sneha (Tila Taila) as the Nasya medium; Yogavahi, Sukshma	Lipid-based vehicle enhancing central uptake of lipophilic constituents
Vata-shamana; correction of the Manovaha Srotas	Down-regulation of arousal via monoaminergic, HPA-axis and autonomic modulation

Pharmacological Plausibility

The therapeutic rationale rests upon the constituents of *Bala* (*Sida cordifolia*). Phytochemical investigations have identified alkaloids such as ephedrine, pseudoephedrine, vasicinone, and vasicinol, along with phytosterols and fatty acids.^[17]

Experimental studies demonstrate that hydroalcoholic extracts of *Sida cordifolia* exert measurable central nervous system depressant effects, including a reduction in spontaneous locomotor activity.^[18] Despite the presence of alkaloids with stimulant properties, the overall pharmacological profile of the whole *Dravya* is depressant, which underscores the classical principle that a *Dravya* functions as a composite entity rather than as an isolated molecule. Moreover, *Sida cordifolia* has been shown to modulate central monoamines (dopamine, serotonin, and noradrenaline), while also exhibiting antioxidant and neuroprotective actions.^[19] More broadly, plant-derived compounds that influence GABAergic transmission form a well-established basis for anxiolytic and sleep-promoting phytomedicines, providing a mechanistic framework for the calming effect traditionally attributed to *Bala*.^[20] When such constituents are prepared in a lipophilic medium and administered nasally, they possess both a coherent route (nose-to-brain axis) and a coherent target (central arousal systems).

7. The Hypothesis

From these points of correspondence, the following hypothesis is advanced: *Ksheerabala Taila Nasya* alleviates *Anidra* by delivering lipophilic, centrally active constituents of *Bala*, dispersed within a sesame-oil and milk lipid matrix, directly to the brain via the olfactory and trigeminal nose-to-brain pathways. These constituents act upon the neural substrates of aggravated *Vata* (heightened arousal, monoaminergic imbalance, dysregulation of the hypothalamic-pituitary-adrenal axis, and autonomic disturbance), thereby facilitating sleep. Within this framework, the *Śṛṅgāṭaka Marma* of classical anatomy corresponds to the olfactory-trigeminal convergence identified in modern pharmaceuticals as the anatomical basis of nasal-central transport. Similarly, the classical use of a *Sneha* medium in *Brimhana Nasya* parallels the contemporary recognition that lipid vehicles favour efficient delivery. This hypothesis is explicitly mechanistic and thus testable; it is not asserted as proven by the evidence presently assembled.

8. Clinical Signals Consistent with the Hypothesis

Direct clinical evidence for *Ksheerabala Taila Nasya* in insomnia remains limited, yet the available findings point in a consistent direction. In a randomized, open-label trial involving

elderly men with primary insomnia, *Brimhana Nasya* using *Ksheerabala Taila* in combination with oral *Ashwagandha* improved subjective sleep quality, latency, duration, and efficiency, an assessment directly relevant to the intervention under consideration.^[5] Similarly, a randomized controlled study in acute insomnia demonstrated that an *Ayurvedic* arm delivered as *Nasya Karma* enhanced sleep quality compared with control.^[21] A registered clinical protocol is currently evaluating *Ksheerabala Taila Nasya* against *Śāṅkhapūṣpī Taila Nasya* in primary insomnia,^[22] while case reports and reviews of *Tila Taila* and other forms of *Nasya* in *Nidranāśa* describe comparable benefits.^[23,24] Although these studies are small in scale and predominantly open-label, their outcomes align with the proposed mechanism. However, none has yet directly measured nasal-to-central drug transport, leaving the mechanistic link to be inferred rather than empirically established.

9. A Testable Research Agenda

Framing *Nasya* within the nose-to-brain paradigm transforms a classical rationale into specific, falsifiable predictions. Four major lines of inquiry emerge. First, pharmacokinetic and biodistribution studies, using animal models and modern imaging techniques, could determine whether the constituents of *Bala*, delivered nasally in *Ksheerabala Taila*, reach central sleep-regulating regions and in what concentrations. Second, mechanistic biomarkers should be integrated into clinical trials: serum or salivary cortisol to assess hypothalamic-pituitary-adrenal axis activity, heart-rate variability to evaluate autonomic tone, and polysomnography or actigraphy with electroencephalography to measure objective sleep architecture. Third, adequately powered randomized trials employing validated instruments such as the Insomnia Severity Index are needed to quantify clinical efficacy. Fourth, further clinical studies on *Ksheerabala Taila Nasya* in *Anidra* are needed to understand its therapeutic potential more clearly and to explore how the nasal route may contribute to its effects. Future research could also focus on understanding the pharmacological and physiological mechanisms involved in the action of *Ksheerabala Taila* when administered through the nasal route. Along with this, proper standardization of the formulation, including evaluation of the active constituents of *Bala*, as well as quality control and dose standardization, would help in establishing a stronger scientific basis for the use of *Ksheerabala Taila Nasya* in the management of *Anidra*.

10. Caveats and Limitations

Several cautions frame the proposed hypothesis. It remains a hypothesis rather than a demonstrated mechanism, and the parallels drawn between classical and modern concepts are

interpretive analogies, not direct identities. Contemporary nose-to-brain evidence is derived largely from engineered nanoformulations and defined single-drug systems; a traditional *taila* differs in particle size, dosage, standardization, and composition. Extrapolation to *Ksheerabala Taila* is therefore provisional and requires empirical validation. Moreover, *Bala* contains ephedrine-type alkaloids with sympathomimetic activity, which introduces both pharmacological and regulatory caveats: stimulant constituents in a sleep-promoting preparation necessitate careful control of dose and standardization, while ephedrine itself is subject to restrictions in certain jurisdictions. Finally, the clinical literature available is small, heterogeneous, and predominantly open-label. Accordingly, conclusions are offered as directions for enquiry rather than definitive claims.

11. CONCLUSION

The classical teaching that the nose is the gateway to the head, embodied in the *Śṛṅgāṭaka Marma*, anticipates, within its own idiom, the nose-to-brain pathway independently mapped by modern pharmaceuticals. Considered together, these perspectives render *Ksheerabala Taila Nasya* a rational and testable intervention for *Anidra*: a lipid medium conveying centrally active, *Vata*-pacifying constituents of *Bala* along a direct nasal route to sleep-regulating centres of the brain. The mechanism proposed here is explicitly framed as a hypothesis to guide future research, and must be judged against the standard of objective evidence it seeks to generate.

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