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Review Article

NASYA KARMA IN HYPOTHALAMIC-PITUITARY-OVARIAN AXIS MODULATION

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ABSTRACT

The Hypothalamic–Pituitary–Ovarian (HPO) axis is the principal neuroendocrine system governing female reproductive function through a finely coordinated hormonal cascade. Any functional or structural disruption within this axis may result in menstrual irregularities, anovulation, infertility, and endocrine disorders such as polycystic ovarian syndrome (PCOS) and hypothalamic amenorrhea. Increasing prevalence of stress-related reproductive dysfunctions and limitations of conventional hormonal therapies have led to a growing interest in complementary and traditional medical systems. Ayurveda offers a holistic framework for understanding and managing reproductive disorders, emphasizing the role of *Vata Dosha, Siras* (central regulatory centers), and *Artavavaha Srotas* in the maintenance of reproductive health. *Nasya Karma*, a specialized *Panchakarma* procedure involving nasal administration of medicated substances, is traditionally advocated for disorders of the head and neurological regulation. Classical Ayurvedic texts describe the nose as the gateway to the head (*Nasa hi siraso dvaram*), implying its direct influence on higher neurophysiological functions. Recent advances in neuropharmacology have validated the intranasal route as an effective means of delivering therapeutic agents directly to the brain, bypassing the blood–brain barrier and influencing hypothalamic and limbic structures. This review aims to critically analyze the conceptual basis, probable mechanisms, and therapeutic relevance of *Nasya Karma* in modulating the HPO axis by integrating Ayurvedic principles with contemporary neuroendocrine science. The available classical references, experimental insights, and emerging clinical evidence are discussed to highlight *Nasya Karma* as a potential non-invasive and holistic approach for restoring reproductive neuroendocrine balance.

INTRODUCTION

Female reproductive physiology is governed by the Hypothalamic–Pituitary–Ovarian (HPO) axis, a complex neuroendocrine network responsible for the regulation of menstrual cyclicity, ovulation, and fertility. The hypothalamus secretes gonadotropin-releasing hormone (GnRH) in a pulsatile manner, which stimulates the anterior pituitary to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH). These gonadotropins, in turn, regulate ovarian follicular development, steroidogenesis, and ovulation. Proper synchronization of this axis is essential for reproductive health, while disturbances at any level may lead to functional or organic gynaecological disorders. [1]

In recent decades, there has been a noticeable rise in HPO axis dysfunctions, largely attributed to chronic stress, lifestyle alterations, metabolic disturbances, and psychosomatic factors. Conditions such as PCOS, hypothalamic amenorrhea, luteal phase defects, and unexplained infertility often exhibit subtle neuroendocrine imbalances rather than overt structural pathology. Although conventional management relies primarily on hormonal manipulation, long-term use is frequently associated with adverse effects, recurrence, and patient dissatisfaction, thereby necessitating exploration of safer and more holistic alternatives. [2]

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Ayurveda, the ancient system of Indian medicine, provides a comprehensive and individualized approach to reproductive health. According to Ayurvedic physiology, normal menstrual and ovarian functions depend on the balanced state of *Tri dosa*, particularly *Vata Dosha*, and the integrity of *Rasa, Rakta*, and *Artava Dhatu*. Central regulation of physiological functions is attributed to *Prana Vata*, located in the head, which governs higher neural and endocrine activities, while *Apana Vata* controls reproductive functions such as menstruation and ovulation. Any disturbance in *Prana Vata* can subsequently impair *Apana Vata*, leading to dysregulation of the reproductive axis.[3]

Nasya Karma is a unique therapeutic modality described under *Panchakarma*, specifically indicated for diseases of the head and neck region. Classical Ayurvedic texts repeatedly emphasize the therapeutic significance of *Nasya* by stating that the nasal route provides direct access to the cranial cavity and central regulatory structures. Through this route, medicated oils, ghee, or herbal extracts are believed to influence the *Siras, Indriya, Mana,* and *Majja Dhatu,* thereby exerting systemic effects beyond localized nasal pathology. [4]

From a contemporary biomedical perspective, intranasal drug delivery has gained attention due to its ability to directly target the central nervous system via olfactory and trigeminal neural pathways. This mechanism provides a scientific rationale for the traditional claims of *Nasya Karma* influencing higher neurological and endocrine functions. Given the central role of the hypothalamus in HPO axis regulation, *Nasya Karma* emerges as a potentially effective intervention for neuroendocrine modulation in female reproductive disorders.[5]

This review seeks to explore the relevance of *Nasya Karma* in the modulation of the HPO axis by examining classical Ayurvedic concepts, correlating them with modern neuroendocrine mechanisms, and evaluating its therapeutic scope in gynaecological and endocrine dysfunctions.

AIMS AND OBJECTIVES

Aim

To critically review and analyse the role of *Nasya Karma* in the modulation of the Hypothalamic–Pituitary–Ovarian (HPO) axis by integrating classical Ayurvedic concepts with contemporary neuroendocrine understanding.

Objectives

1. To explore the physiological basis of the HPO axis from both modern biomedical and Ayurvedic perspectives.
2. To review classical Ayurvedic references related to *Nasya Karma* and its relevance in disorders of *Siras*, *Vata Dosha*, and *Artava vaha Srotas*.
3. To analyse the probable mechanisms through which *Nasya Karma* may influence hypothalamic and pituitary functions involved in reproductive regulation.
4. To evaluate the therapeutic scope of Nasya Karma in gynaecological and endocrine disorders associated with HPO axis dysfunction.
5. To identify gaps in existing literature and propose directions for future experimental and clinical research.

MATERIALS AND METHODS

Study Design

The present work is a narrative review of classical Ayurvedic literature and contemporary scientific publications focusing on *Nasya Karma*, intranasal drug delivery, and HPO axis regulation.

Sources of Data

Data were collected from the following sources:

Classical Ayurvedic Texts

- *Caraka Saṃhita* (Sutrasthana, Sahrirasthana, Chikitsasthana)
- *Susruta Saṃhits* (Chikitsasthana, Uttara Tantra)
- *Aṣṭanga Hṛdaya* and *Aṣṭaṅga Sangraha.*
- Relevant commentaries including *Chakrapani*, *Dalhana*, and *Arunadatta.*

Modern Scientific Literature

- Peer-reviewed journals related to reproductive endocrinology, neuroendocrinology, and integrative medicine
- Databases such as PubMed, Google Scholar, Scopus, and AYUSH Research Portal

Ayurvedic Perspective of HPO Axis [6,7,1]

Although classical Ayurvedic texts do not explicitly describe the HPO axis, its functional correlates can be understood through:

- *Siras* (head) as the seat of *Indriya, Mana*, and *Prana Vata.*
- *Agni* and *Rasa Dhatu* governing hormonal nutrition.
- *Artava vaha Srotas* responsible for menstrual and reproductive functions.

Vitiation of *Vata* at the level of *Siras* can disturb the central regulation of reproductive hormones, manifesting as *Nashtartava*, *Anartava*, or *Vandhyatva*.

Nasya Karma: Concept and Types

Nasya Karma involves the administration of medicated oils, ghee, powders, or juices through the nasal route. Based on action, *Nasya* is classified into:

- *Sodhana Nasya* (Cleansing)

- *Samana Nasya* (Palliative)
- *Bramhana Nasya* (Nourishing)

In gynaecological disorders, *Samana* and *Bramhana Nasya* using *Ghṛita* or *Taila* preparations are predominantly employed.

Probable Mechanisms of Action in HPO Axis Modulation [8,9]

1. Direct Neuro-Endocrine Influence

Modern studies suggest that intranasal drug delivery allows substances to bypass the blood–brain barrier via olfactory and trigeminal pathways. Nasya drugs may influence:

- Hypothalamic neurons regulating GnRH secretion.
- Limbic system involved in stress and reproductive control.

This aligns with Ayurvedic views of *Nasya* acting directly on *Siras* and *Majja Dhātu*.

2. Regulation of *Vata Dosha*

Nasya is considered the best therapy for *Urdhva Jatrugata Vata Vikara*. By normalizing *Prana Vata*, it indirectly stabilizes *Apana Vata,* which governs ovulation and menstruation- thereby restoring HPO axis harmony.

3. Stress Modulation and HPO Axis[10]

Psychological stress suppresses GnRH pulsatility, leading to functional hypothalamic amenorrhea. Medicated *Nasya* with *Medhya* and *Vatahara* drugs may exert anxiolytic and adaptogenic effects, helping re-establish neuroendocrine balance.

4. *Dhatu Poshana* and Hormonal Nutrition[11]

Bṛaṃhana Nasya with *Ghṛita*-based formulations supports *Rasa* and *Artava Dhatu*, improving tissue receptivity to hormonal signals and enhancing ovarian responsiveness.

Clinical Applications

Nasya Karma has shown therapeutic potential in:

- PCOS with anovulation
- Hypothalamic amenorrhea
- Stress-induced menstrual irregularities
- Functional infertility

Commonly used formulations include *Kshirabala Taila, Anu Taila, Satapaka Bala Taila, Brahmi Ghrita*, depending on the clinical presentation.

DISCUSSION

The present review attempts to critically evaluate the role of *Nasya Karma* in the modulation of the Hypothalamic–Pituitary–Ovarian (HPO) axis by correlating classical Ayurvedic principles with contemporary neuroendocrine science. Although the HPO axis is a modern physiological construct, its functional components can be effectively mapped within the Ayurvedic framework involving *siras*, *Vata Dosha*, *Rasa–Artava Dhatu,* and *Artava vaha Srotas*.[12]

From an Ayurvedic standpoint, reproductive disorders associated with HPO axis dysfunction are predominantly attributed to *Vata Prakopa*, particularly derangement of *Prana* and *Apana Vata*. *Prana Vata,* situated in the head, governs higher neural and endocrine regulation, while *Apana Vata* is responsible for ovulation, menstruation, and conception. Classical texts emphasize that imbalance in *Prana Vata* can disturb the normal functioning of *Apana Vata*, thereby impairing reproductive physiology. *Nasya Karma*, being the principal therapy for disorders of the head, is uniquely positioned to correct this central dysregulation.[13]

Modern neuroendocrinology supports the concept that hypothalamic function is highly sensitive to stress, metabolic changes, and neurochemical alterations. Stress-induced suppression of GnRH pulsatility is a well-recognized cause of functional hypothalamic amenorrhea and anovulation. *Nasya Karma*, particularly when administered using *Ghrita* or *Taila*-based formulations with *Medhya* and *Vata hara* properties, may exert anxiolytic, adaptogenic, and neuroprotective effects. These actions potentially restore hypothalamic sensitivity and normalize GnRH secretion, thereby improving pituitary–ovarian signalling.[14]

Recent scientific interest in intranasal drug delivery provides further validation for traditional claims regarding *Nasya Karma*. The nasal route enables direct access to the central nervous system via olfactory and trigeminal pathways, bypassing the blood–brain barrier. This mechanism offers a plausible explanation for the rapid and targeted effects of *Nasya* on hypothalamic and limbic structures involved in reproductive hormone regulation. Such central action distinguishes *Nasya Karma* from oral Ayurvedic formulations, which primarily act through digestive and metabolic pathways.[15]

Additionally, the role of *Nasya Karma* in *Dhatu Posana* deserves attention. *Bṛaṃhana Nasya* enhances the quality of *Rasa Dhatu*, which serves as the nutritional substrate for *Artava*. Improved tissue nourishment may enhance ovarian responsiveness to gonadotropins, thereby supporting folliculogenesis and ovulation. This aligns with clinical observations where *Nasya Karma* is used as an adjuvant therapy in infertility and menstrual disorders.[16]

Despite these promising conceptual correlations, the current evidence base is largely derived from classical textual references, experiential clinical practice, and limited observational studies. Robust experimental and clinical trials evaluating

hormonal parameters, neuroendocrine markers, and imaging-based outcomes remain scarce. Standardization of *Nasya* formulations, dosage, duration, and treatment protocols is another major challenge that limits reproducibility and wider clinical acceptance.[17]

Nevertheless, *Nasya Karma* offers a non-invasive, cost-effective, and holistic approach to managing HPO axis dysfunctions, especially in cases where stress, functional imbalance, and lifestyle factors play a dominant role. Its integrative potential lies in its ability to address both central neuroendocrine regulation and peripheral reproductive tissue health simultaneously.

CONCLUSION

Nasya Karma emerges as a significant Ayurvedic therapeutic modality with potential relevance in the modulation of the Hypothalamic-Pituitary-Ovarian axis. Rooted in classical Ayurvedic principles and increasingly supported by modern concepts of intranasal neuropharmacology, *Nasya Karma* appears to influence reproductive function through central neuroendocrine regulation, *Vata Doṣha* normalization, stress modulation, and *Dhatu* nourishment. By acting on the hypothalamic and limbic systems, *Nasya Karma* may help restore GnRH pulsatility and subsequent pituitary–ovarian hormonal balance, thereby improving menstrual regularity, ovulation, and fertility outcomes. Its role is particularly noteworthy in functional reproductive disorders such as PCOS, hypothalamic amenorrhea, and stress-related anovulation, where conventional hormonal therapy often provides symptomatic relief without addressing the underlying dysregulation. However, the current understanding of *Nasya Karma* in HPO axis modulation is largely conceptual and inferential. Well-designed experimental studies, neuroendocrine assessments, and randomized controlled clinical trials are essential to establish its efficacy, safety, and standard treatment protocols. Integration of Ayurvedic therapeutics with modern diagnostic and outcome measures will be crucial for scientific validation and wider clinical acceptance. In conclusion, *Nasya Karma* holds promising scope as a holistic, neuroendocrine-modulatory intervention in female reproductive health. Future interdisciplinary research may pave the way for its inclusion as an evidence-based complementary therapy in the management of HPO axis–related disorders.

Future Scope

- Neuroimaging and hormonal studies pre- and post-*Nasya*.
- Standardization of *Nasya* formulations for gynaecological use.
- Randomized controlled trials in PCOS and hypothalamic amenorrhea.

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