WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.63
Volume 15, Issue 12, 1748-1764. Review Article ISSN 2277–7105

KARNAVEDHA SAMSKARA IN THE PREVENTION AND MANAGEMENT OF TAMAKA SHWASA (BRONCHIAL ASTHMA): AN AYURVEDIC REVIEW WITH NEURO-IMMUNOLOGICAL PERSPECTIVES

[1]*Dr. Arvinder, [2]Dr. Paravreet Kaur, [3]Dr. Anurag Kushal, [4]Dr. Ritika Verma, [5]Dr. Rohit, [6]Dr. Ishita Mittal

[1]*Centre for Public Health, Panjab University, Chandigarh.
[2]Faculty, Centre for Public Health, Panjab University, Chandigarh, India.
[3]Assistant Professor, Department of Panchakarma, National Institute of Ayurveda, Panchkula, Haryana, India.
[4]Associate Professor, Department of Samhita and Siddhanta, Shri Dhanwantri Ayurvedic Medical College and Hospital, Chandigarh, India.
[5]Intern, Bachelors in Medicine and Bachelors in Surgery, Alte University, Tbilisi, Georgia.
[6]Centre for Public Health, Panjab University, Chandigarh, India.

Article Received on 15 May 2026,
Article Revised on 05 June 2026,
Article Published on 16 June 2026,
https://doi.org/10.5281/zenodo.20730996

***Corresponding Author**
Dr. Arvinder
Centre for Public Health, Punjab University, Chandigarh.

How to cite this Article: [1]*Dr. Arvinder, [2]Dr. Paravreet Kaur, [3]Dr. Anurag Kushal, [4]Dr. Ritika Verma, [5]Dr. Rohit, [6]Dr. Ishita Mittal (2026). Karnavedha Samskara In The Prevention And Management Of Tamaka Shwasa (Bronchial Asthma): An Ayurvedic Review With Neuro-Immunological Perspectives. World Journal of Pharmaceutical Research, 15(12), 1748–1764.

ABSTRACT

Bronchial asthma is an inflammatory airway disorder which is chronic in nature and symptoms are airflow limitation, bronchial hyper-responsiveness, and recurrent episodes of wheezing, cough, chest tightness, and breathlessness. In the current era there are various advances in pharmaceutical management but still asthma continues to impose a substantial global health burden and still there's a significant rise in morbidity and impaired quality of life. Ayurveda describes Tamaka Shwasa as a chronic respiratory disorder and the symptoms of Tamaka Shwasa are similar to Bronchial Asthma and there is a lot of similarity between pathogenesis, precipitating factors, and recurrent nature of both. Among the Shodasha Samskaras described in Ayurvedic literature, Karnavedha Samskara is traditionally regarded not merely as an ornamental procedure but also as a measure for disease prevention and maintenance of health. Recently emerging advances in auricular medicine, neurophysiology, and neuro -immunology have brought into focus the therapeutic role of the

external ear. The auricle contains an intricate network of neurons associated with the auricular vagus branch, trigeminal, facial nerves, and cervical plexus, making it possible to use the auricle as a medium of systemic physiological control. Auricular acupuncture and transcutaneous auricular vagus nerve stimulation have been shown to exert anti-inflammatory and autonomic regulation via the cholinergic anti-inflammatory pathway. This mechanism might find application in the treatment of chronic inflammatory conditions such as bronchial asthma. This review explores about the ancient Ayurvedic theories of Karnavedha and Tamaka Shwasa in detail and links them to the current literature on auricular neuro-anatomy, vagal control, and neuro-immune interaction. A novel hypothesis integrating Karnavedha as a means of airway inflammation modulation is presented. Despite the absence of direct scientific evidence regarding the impact of Karnavedha on bronchial asthma, the available scientific information supports biological feasibility and gives grounds for further interdisciplinary research.

KEYWORDS: Karnavedha Samskara, Tamaka Shwasa, Bronchial Asthma, Auricular Medicine, Vagus Nerve, Neuroimmunology, Inflammatory Reflex, Ayurveda.

1. INTRODUCTION

Bronchial asthma is a chronic inflammatory disorder of the airways characterized by variable airflow limitation, airway hyper-responsiveness, and recurrent episodes of wheezing, dyspnoea, cough, and chest tightness.[1], It represents one of the most prevalent chronic respiratory disorders worldwide and affects individuals of all age groups. According to the Global Initiative for Asthma (GINA), asthma affects more than 300 million people globally and continues to constitute a major public health concern because of its increasing prevalence and recurrent exacerbations.[2] Although modern pharmacotherapy has substantially improved disease control, long-term treatment is often associated with adverse effects, economic burden, and persistent impairment in quality of life.[3]

Ayurveda emphasizes preventive healthcare through maintenance of physiological equilibrium and preservation of health. Among the sixteen Samskaras described in classical literature, Karnavedha Samskara occupies a distinctive place. Traditionally performed during infancy or childhood, Karnavedha is commonly regarded as a cultural practice involving ear piercing. However, classical texts assign considerable prophylactic and therapeutic significance to this procedure and describe it as beneficial for disease prevention and maintenance of health.[4,5]

Recent advances in neuroscience and bio-electronic medicine have renewed scientific interest in the external ear. The auricle possesses a complex innervation involving the auricular branch of the vagus nerve, trigeminal nerve, facial nerve, and cervical plexus.[6] Experimental and clinical studies have demonstrated that auricular stimulation can influence autonomic regulation and modulate inflammatory pathways.[7,8]

The discovery of the inflammatory reflex and the cholinergic anti-inflammatory pathway have further highlighted the role of the vagus nerve in controlling cytokine production and maintaining immune homeostasis.[9] Since chronic airway inflammation constitutes the hallmark of bronchial asthma, neuro-modulatory effects mediated through auricular pathways may possess therapeutic significance. Consequently, Karnavedha Samskara may have physiological implications extending beyond its cultural and ornamental dimensions.

The present review aims to critically analyse the classical Ayurvedic concepts related to Karnavedha and Tamaka Shwasa and correlate them with current understanding of auricular neuro-anatomy, vagal regulation, and neuro-immunological mechanisms involved in bronchial asthma.

Scientific research suggests that there is a significant correlation between auricular stimulation and the process of autonomic regulation and inflammatory response modification.[7,8]

The purpose of the present article is to explore classic Ayurvedic theories and practices regarding Karnavedha and Tamaka Shwasa in relation to modern concepts of auricular neurophysiology and patho-physiological mechanisms of bronchial asthma.

2. HISTORICAL BACKGROUND OF KARNAVEDHA AND ITS THERAPEUTIC SIGNIFICANCE

The samskaras are considered an important aspect of Ayurveda and Vedas, and they are carried out to help in the process of physical, mental, and spiritual development. In the case of Karnavedha, it is one of the sixteen samskaras and has always been carried out when the individual was still an infant.[4] The ancient practitioners did not see this ritual as simply ornamental but rather one aimed at helping to prevent diseases and promoting good health.

Acharya Sushruta gave a detailed description of the procedure of Karnavedha, and he said that ear piercing must be done cautiously and on the anatomically correct part of the ear[5] According to him, ear piercing could be dangerous as it could cause damage to the tissues surrounding the vascular structures.[10]

According to Dalhana, an important scholar of the Sushruta Samhita, the benefits of Karnavedha included prevention of diseases and promotion of positive health[11], Just like Sushruta and Dalhana, Vagbhata has also referred to Karnavedha as one of the most important samskaras.[12]

Traditional literature attributes several therapeutic benefits to Karnavedha, including prevention of diseases affecting the head and neck region, maintenance of general health, and promotion of normal physiological functioning.[13] Although these explanations are expressed in classical Ayurvedic terminology, they suggest empirical recognition of systemic effects associated with stimulation of specific auricular regions.

Comparable concepts are observed in Chinese medicine and modern auriculo-therapy. Paul Nogier proposed the theory that the auricle represents a micro-system corresponding to the entire body and introduced the concept of the inverted fetus map of the ear.[14] This hypothesis subsequently contributed to the development of auricular medicine and stimulated scientific investigations regarding the therapeutic significance of auricular stimulation.[15]

Modern anatomical studies have demonstrated that the external ear possesses rich innervation by branches of the vagus nerve, trigeminal nerve, and cervical plexus[6], Through these neural connections, stimulation of the auricle may influence central autonomic pathways and systemic physiological functions.[16]

Thus, the preventive importance assigned to Karnavedha by ancient Ayurvedic scholars may represent early empirical observations that anticipated contemporary concepts of auricular neuro-modulation and neuro-physiological regulation.

3. TAMAKA SHWASA AND BRONCHIAL ASTHMA: A COMPARATIVE REVIEW

Shwasa Roga is described in Ayurvedic classics as a group of respiratory disorders characterized by difficulty in breathing and impairment of normal respiratory functions.

Among its five types, Tamaka Shwasa is considered the most clinically significant because of its chronic and recurrent nature.[17] Classical descriptions reveal striking similarities between Tamaka Shwasa and bronchial asthma, thereby enabling meaningful comparison between traditional and contemporary concepts.

Acharya Charaka described Tamaka Shwasa as a Yapya Vyadhi, implying that the disease is chronic and amenable to long-term management rather than complete cure.[18] The pathogenesis involves aggravation of Vata and Kapha Doshas, leading to obstruction of Pranavaha Srotas and impairment of normal respiration.[19] Vitiated Kapha causes blockage of respiratory channels, while aggravated Vata, unable to follow its normal course, moves in an abnormal direction and gives rise to respiratory distress.[20]

Clinical manifestations of Tamaka Shwasa include Shwasa Krichrata (difficulty in breathing), Ghurghuraka (wheezing sounds), Kasa (cough), Peenasa (nasal symptoms), inability to lie comfortably, and relief in sitting posture.[17,20]

Exacerbations are precipitated by dust, smoke, cold exposure, indigestion, excessive exertion, emotional disturbances, and seasonal variations[21], These descriptions demonstrate remarkable resemblance to the triggering factors and symptomatology observed in bronchial asthma.

In modern medicine, bronchial asthma is defined as a chronic heterogeneous inflammatory disease characterized by variable airway obstruction, bronchial hyper-responsiveness, and reversible airflow limitation.[1] The disease results from complex interactions among genetic predisposition, environmental exposures, and immunological mechanisms.[22] Hallmark pathological changes include eosinophilic infiltration, mast cell activation, goblet cell hyperplasia, mucus hyper-secretion, and airway remodelling.[23]

Type 2 helper T-cell-mediated inflammation plays a pivotal role in asthma pathogenesis. Cytokines such as interleukin-4, interleukin-5, interleukin-13, and tumour necrosis factor-alpha contribute to airway inflammation, bronchial hyper-reactivity, and excessive mucus production.[24] Exposure to allergens, viral infections, tobacco smoke, environmental pollutants, and climatic changes can precipitate recurrent attacks.[25]

A comparative evaluation reveals substantial similarities between Tamaka Shwasa and bronchial asthma with respect to etiological factors, symptoms, recurrent nature, chronicity,

and requirement for prolonged management.[26] The Ayurvedic concept of Kapha-induced obstruction of Pranavaha Strotas bears resemblance to mucus hyper-secretion and airway narrowing observed in asthma, whereas aggravated Vata corresponds to broncho-spasm and abnormal respiratory movements.[27]

Furthermore, the Yapya nature of Tamaka Shwasa parallels the chronic relapsing course of bronchial asthma recognized in modern medicine. Consequently, most contemporary Ayurvedic scholars consider Tamaka Shwasa to represent the closest clinical equivalent of bronchial asthma.[28]

Recognition of these similarities provides a conceptual framework for exploring the possible role of Karnavedha Samskara in modulating inflammatory and neuro-physiological mechanisms involved in asthma.

4. AURICULAR NEUROANATOMY AND MECHANISTIC BASIS OF KARNAVEDHA

The outer ear has one of the most complex innervations systems in the human body.[6] The uniqueness of this anatomical structure forms the foundation for studying systemic physiological effects caused by auricular stimulation.

The auricle receives innervation from different cranial and cervical nerves such as auricular nerve of vagus nerve (Arnold's nerve), auriculo-temporal nerve from the trigeminal nerve, branches of the facial nerve, the great auricular nerve, and lesser occipital nerve.[29] All these neural structures play an important role in the physiology of auricular structures, but special attention should be paid to the auricular branch of the vagus nerve because it is the only superficial distribution of vagus nerve.[30]

The most significant contribution towards the innervation of the concha, cymba conchae, and parts of the external auditory canal is made by the ABVN[31] According to anatomical studies conducted by Peuker and Filler, fibres from the vagus nerve play an essential role in innervating the ear and form the structural basis for neuro-modulatory effects caused by auricular stimulation.[31]

Impulses from the auricle are carried to the nucleus tractus solitarius (NTS), which acts as the primary sensory nucleus of the vagus nerve in the brain stem[32] In addition, the NTS has functional links to the hypothalamus, amygdala, parabrachial nucleus, locus coeruleus, and

the dorsal motor nucleus of the vagus, making it an important part of the central autonomic network.[33]

Thus, through such connections, auricular stimulation is able to modulate autonomic functions, cardiovascular control, neuro-endocrine function, and inflammation.[34] Neuro-imaging studies of transcutaneous auricular vagus nerve stimulation (taVNS) have shown connections between auricular stimulation and brainstem autonomic centres, including NTS, as well as cerebral and limbic structures responsible for autonomic and emotional regulation, thus highlighting the potential for central neuro-modulation.[35]

There is evidence that nucleus tractus solitarius, thalamus, insular cortex, and limbic system become activated by auricular vagus nerve stimulation through functional MRI studies indicating the presence of neuro-modulatory function of central nervous system.[35]

In addition to vagal innervations, there is an involvement of trigeminal nerves in the sensory innervation of the anterior part of the auricle. The afferent impulses of trigeminal nerve influence the activities of brain stem nuclei that are involved in respiratory and cardiovascular regulations.[36] Again, the somatic sensory fibres of great auricular and lesser occipital nerves of cervical plexus might participate in the central neural regulation.[37]

Notably, Acharya Sushruta cautioned about the significance of anatomical site for performing Karnavedha and advised about the need to avoid the risk of injury to the vessels and vital structures.[5,10] It is clear from such descriptions that the ancient Ayurvedic surgeons had empirical knowledge of the significance of the anatomy of auricle.

In a modern interpretation of Karnavedha, it is possible to view Karnavedha as a technique of mechanical auricular stimulation that triggers the activity of nerves controlling the autonomic nervous system functions. Due to the strong association between the auricle and vagal nerves, Karnavedha stimulation can lead to physiological processes taking place outside the stimulated area.

Hence, there is scientific credibility in the application of auricular nerves in explaining the effectiveness of Karnavedha Samskara.

5. AURICULAR MEDICINE AND CLINICAL EVIDENCE IN ASTHMA

It is interesting to note that the idea that auricular stimulation can impact distant parts of the body has existed since time immemorial within different traditional medical disciplines. The

science of modern auriculotherapy evolved on the basis of discoveries by Paul Nogier, who postulated that there exists an auricular microsystem that corresponds to the whole body.[14] His inverted fetus theory stated that there were functional relationships between certain zones of the external ear and organs and body structures. This discovery laid the foundation of modern auriculotherapy and triggered much more research in the field.[15]

Acknowledging the ever-growing body of evidence proving the effectiveness of auricular treatment, the WHO established a standardized nomenclature for auricular acupuncture as a form of complementary treatment.[38] Since then, many studies have explored its possible use in the treatment of different pain syndromes, anxiety, insomnia, obesity, addiction, and inflammation.[39]

Respiratory system diseases are also of great interest within the scope of auricular medicine. Multiple authors have shown a positive effect on lung function tests, symptom score, and quality of life in patients suffering from bronchial asthma and undergoing auricular treatment in addition to standard pharmacological therapy.[40,41] Reduction in the frequency of attacks and decreased requirement for bronchodilator medications have also been described.

Yu et al observed significant clinical improvement and enhancement of peak expiratory flow rates following auricular acupuncture in asthmatic patients[42], Similarly, observations have been reported by other investigators, although methodological limitations, heterogeneity of treatment protocols, and relatively small sample sizes necessitate cautious interpretation of the available evidence.[43]

The emergence of bio-electronic medicine has further expanded interest in auricular interventions. Trans-cutaneous auricular vagus nerve stimulation (taVNS) has recently gained attention as a non-invasive technique capable of stimulating vagal afferents through the external ear.[44] Experimental and clinical studies have demonstrated that taVNS influences autonomic activity, modulates inflammatory responses, and improves physiological functions in various chronic disorders.[45]

Animal studies have shown that vagus nerve stimulation can attenuate airway inflammation and reduce bronchial hyper-responsiveness in allergic asthma models[46] Investigators have also reported decreased eosinophilic infiltration and suppression of inflammatory cytokine expression following vagal stimulation.[47]

In addition, stimulation of vagally innervated regions of the auricle has been associated with enhancement of parasympathetic tone and improvement in heart rate variability, indicating restoration of autonomic balance.[48] Since autonomic dysregulation contributes significantly to the patho-physiology of asthma, modulation of these pathways may have therapeutic implications.[49]

Although direct clinical studies investigating Karnavedha Samskara in bronchial asthma are currently unavailable, observations derived from auricular acupuncture and trans-cutaneous vagus nerve stimulation provide indirect evidence supporting the biological plausibility of this traditional procedure. Consequently, contemporary developments in auricular medicine serve as an important bridge connecting Ayurvedic concepts with modern neuroscience.

6. NEUROIMMUNOLOGICAL BASIS OF KARNAVEDHA

Neuro-immunology has emerged as an important interdisciplinary field concerned with interactions between the nervous system and immune responses. One of the most significant discoveries in this area is the inflammatory reflex described by Tracey and colleagues, which demonstrated that neural pathways could regulate immune activity and cytokine production.[9]

The inflammatory reflex represents a physiological mechanism through which the vagus nerve modulates systemic inflammation and maintains immune homeostasis.[50] Activation of vagal pathways results in release of acetylcholine, which interacts with α7 nicotinic acetylcholine receptors expressed on macrophages and other immune cells.[51] This interaction suppresses synthesis and release of pro-inflammatory mediators and constitutes the basis of the cholinergic anti-inflammatory pathway.[52]

Through this mechanism, vagal activation inhibits production of cytokines such as tumour necrosis factor-alpha, interleukin-1β, and interleukin-6, thereby limiting excessive inflammatory responses.[53]

Consequently, neural regulation through vagal pathways plays a crucial role in maintaining physiological equilibrium.

Bronchial asthma is fundamentally a chronic inflammatory disorder characterized by eosinophilic infiltration, mast cell activation, increased immunoglobulin E production, and

exaggerated Type 2 helper T-cell responses[23] Cytokines including interleukin-4, interleukin-5, and interleukin-13 are principally responsible for mucus hypersecretion, eosinophilic inflammation, airway remodelling, and bronchial hyper-responsiveness.[24]

Experimental studies have demonstrated that vagus nerve stimulation attenuates allergic inflammation and reduces eosinophilic infiltration within respiratory tissues[46,47] Furthermore, neural regulation influences airway smooth muscle tone and contributes to control of broncho-constriction, thereby affecting respiratory function.[49]

The nucleus tractus solitarius and associated structures of the central autonomic network integrate sensory inputs and coordinate interactions between neural and immune systems through descending autonomic pathways.[33] Consequently, stimulation of auricular afferents may influence systemic inflammatory responses and contribute to restoration of physiological homeostasis.

Considering the rich vagal innervation of the external ear and the anti-inflammatory properties mediated through the cholinergic pathway, Karnavedha may possess neuro-immuno-modulatory potential capable of influencing mechanisms involved in bronchial asthma. Such an interpretation provides a rational scientific framework for understanding the traditional health-promoting significance attributed to Karnavedha Samskara.

However, these effects remain hypothetical and require rigorous experimental and clinical validation. Current advances in neuro-immunology nevertheless provide a biologically plausible explanation that may help bridge ancient Ayurvedic observations with contemporary concepts of neural regulation of inflammation.

7. INTEGRATIVE MECHANISTIC MODEL LINKING KARNAVEDHA WITH BRONCHIAL ASTHMA

The preventive importance of Karnavedha Samskara discussed in ancient texts on Ayurveda can be explained using the knowledge available in neuro-physiology and neuro-immunology. Even though there have been no scientific studies directly correlating Karnavedha and bronchial asthma, combining ancient knowledge and scientific experiments will lead us to come up with an explanatory mechanism for this preventive method.

The mechanical stress created during the piercing procedure results in sensory stimuli along fibres present in the external auditory meatus, including branches of vagus, trigeminal and

cervical plexus nerves.[6,31] These neural impulses get relayed in the nucleus tractus solitarius which is the main relay station for vagal afferents.[32] These afferent neural signals get transferred to the hypothalamus, amygdala, insular cortex, parabrachial nucleus and dorsal motor nucleus of the vagus to coordinate the autonomic and neuro-endocrine response.[33]

Stimulation of these neural networks could increase the activity of vagal fibres leading to activation of cholinergic anti-inflammatory pathway[50,51] This leads to acetylcholine release from vagus efferent stimulating α7 nicotinic acetylcholine receptors in immune cells to prevent excessive production of pro-inflammatory cytokines.[52,53]

Reduction of inflammatory mediator levels, including tumour necrosis factor-alpha, interleukin-1β, interleukin-4, interleukin-5, and interleukin-13, may lead to decreased eosinophilic inflammation, mucus overproduction, and hyper-reactivity of airways that characterizes bronchial asthma.[24,46,47] At the same time, autonomic balance normalization may help regulate broncho motor function and decrease excessive airway constriction caused by asthmatic attacks.[49]

From the point of view of Ayurveda, this effect may indicate maintaining the integrity of Pranavaha Strotas, elimination of Kapha-induced obstruction, and normalization of Vata activity[19,20] Hence, the traditional concept of disease prevention through Karnavedha can be considered as preservation of physiological homeostasis via neuro-immunological modulation.

Thus, the technique of Karnavedha Samskara may serve as an example of integration of preventive medicine and bio-electronic approach. However, the described theory needs further investigation with experimental and clinical research.

8. FUTURE PERSPECTIVES AND RESEARCH DIRECTIONS

Despite the many developments in the fields of auricular neurology and neuro-immunology, there is relatively scant evidence available about the physiological impact of Karnavedha Samskara. Consequently, a series of scientific evaluations are necessary to understand its therapeutic implications and physiological mechanisms.

Animal model studies using allergic asthma can give important information about the impact of auricular therapy on inflammation in the lungs, cytokines, and pulmonary function.[46,47]

Histopathologic studies and measurements of inflammatory mediators will shed light on the underlying mechanisms of Karnavedha.[46,47]

Physiological measurements, like heart rate variability, vagal tone, and serum biomarkers of inflammation, might give objective data about the physiological mechanisms involved in Karnavedha[48] Imaging studies such as fMRI and PET can show the activity of central nervous systems after auricular stimulation.[35]

Large-scale epidemiological studies comparing the prevalence and severity of respiratory disorders among individuals with and without Karnavedha may provide indirect evidence supporting traditional claims. Likewise, randomized controlled trials investigating its adjunctive role in patients with bronchial asthma would contribute significantly to evidence-based evaluation.

Standardization of the procedure with respect to age, anatomical site, aseptic precautions, and technique is essential to ensure reproducibility and scientific reliability.[5,10] Interdisciplinary collaboration among Ayurvedic scholars, anatomists, neuroscientists, immunologists, pulmonologists, and experts in bio-electronic medicine may facilitate translational research in this emerging area.

The growing interest in vagus nerve stimulation and bio-electronic medicine provides a favourable scientific environment for exploring traditional procedures such as Karnavedha from a contemporary perspective. Such investigations may ultimately contribute to the development of integrative approaches for the prevention and management of chronic inflammatory disorders, including bronchial asthma.

9. CONCLUSION

Karnavedha Samskara, one of the Shodasha Samskaras described in Ayurvedic literature, possesses significance extending beyond its cultural and ornamental dimensions. Classical texts attribute preventive and health-promoting properties to this procedure, indicating that ancient physicians recognized its potential physiological importance.[4-5]

Recent advances in auricular medicine, neuro-anatomy, and neuro-immunology provide a scientific framework that supports the biological plausibility of these traditional observations. The rich innervation of the external ear by the auricular branch of the vagus nerve and

associated neural pathways establishes an anatomical substrate through which auricular stimulation may influence autonomic regulation and immune functions.[6,31]

Evidence derived from auricular acupuncture, transcutaneous auricular vagus nerve stimulation, and inflammatory reflex research suggests that activation of vagal pathways can suppress inflammatory mediators and promote immune homeostasis.[9,50,53] Since chronic airway inflammation and bronchial hyper-responsiveness constitute the fundamental pathological processes underlying bronchial asthma, modulation of these pathways may possess therapeutic relevance.

Although direct evidence concerning the role of Karnavedha in bronchial asthma is presently lacking, the convergence of Ayurvedic principles with modern neuroscience highlights a promising area for interdisciplinary investigation. Scientific validation through experimental studies and well-designed clinical trials is necessary before definitive conclusions can be established.

Thus, Karnavedha Samskara may represent a remarkable example of traditional preventive medicine whose mechanisms are beginning to be understood through contemporary advances in neuro-immunology and bio-electronic medicine, thereby opening new avenues for integrative approaches in the prevention and management of Tamaka Shwasa (bronchial asthma).

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