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Analytical Study On Physiological Aspect Of *Vata* Dosha

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ABSTRACT :

Vata is one of the three primary *doshas* in Ayurveda, alongside *Pitta* and *Kapha*. It is defined as the driving force behind all motion, communication, and coordination which is integral to numerous bodily processes. Its influence governs the various aspects of life, enabling movement, energy transfer, and the flow of communication within the body and mind. Physiologically, *Vata* is responsible for essential activities such as respiration, circulation, digestion, excretion, and the functioning of the nervous system. These processes ensure the maintenance of homeostasis and the body's adaptability to internal and external changes.

Vata's influence is intricately linked to its interplay with *Pitta* and *Kapha*, ensuring systemic harmony. While *Kapha* provides stability and structure, *Pitta* drives the metabolic transformation, whereas *Vata* enables the movement and communication necessary for their functions. This holistic perspective highlights *Vata's* significance not only in promoting homeostasis but also in addressing imbalances that can lead to the onset and progression of disease. Understanding and managing *Vata* through proper diet, lifestyle, and therapeutic interventions remain essential components of Ayurveda's approach to health and healing. This paper aims to analyse and evaluate the numerous roles of the *Vata* dosha in light of present physiological understanding.

KEYWORDS : Vata, Pitta, Kapha, Humours , Physiology, Dosha

INTRODUCTION

One of the core principles of Ayurveda is understanding health and disease through the fundamental theory of *Tridosha*.¹ The term *Tridosha* refers to an Ayurvedic concept consisting of three essential biological energies: *Vata*, *Pitta*, and *Kapha*. These *Doshas* regulate homeostasis and overall well-being in living beings. When they remain in equilibrium, health is maintained, whereas any deviation leads to disease.² The *Tridoshas* represent different energy forms: *Vata* corresponds to kinetic energy, *Pitta* to thermal energy, and *Kapha* to mechanical energy. Maintaining balance among these energies is crucial for sustaining good health.³

Doshas are considered *Panchabhautika Dravyas* (composed of the five elements).⁴ They act as the *Samavayi Karana* (inherent cause) for both health and disease.⁵ The term *Vata* originates from the root “*Va*,” which signifies movement (*Gati*) and sensory perception (*Gandhana*). The root meaning of *Gati* includes three

aspects: motion (*Gati*), cognition (*Gnana*), and attainment (*Prapti*). *Gandhana* denotes enthusiasm (*Utsaha*), expression (*Prakasha*), guidance (*Soochana*), and destruction (*Himsa*).⁶

Vata Dosha, one of the three fundamental *Sharirika Doshas* in Ayurveda, plays a central role in understanding health and the pathogenesis of diseases in the human body. As the primary *Dosha* governing movement, communication, and energy flow, it is integral to maintaining physiological balance. While *Kapha* provides stability and structure, and *Pitta* drives metabolic transformation, *Vata* enables the movement and communication necessary for their functions. Understanding and managing *Vata* through proper diet, lifestyle, and therapeutic interventions remain essential components of Ayurveda's approach to health and healing.

The significance of *Vata* is emphasized by the fact that *Pitta*, *Kapha*, the tissues (*Dhatus*), and excretory products are all unable to move independently. They are all propelled by *Vayu* from one place to another, much like how wind carries clouds across the sky.⁷ The *Vata dosha* has certain characteristic properties such as *rooksha* (dryness), *laghu* (lightness), *sheeta* (cold), *khara* (rough), *sookshma* (minute), *chala* (movement), *vishada* (clear).^{8,9}

Vata is responsible for critical functions such as *utsaha* (enthusiasm), *uchvasa* (inhalation), *nishvasa* (exhalation), *chesta* (voluntary and involuntary actions), *vega pravartana* (initiation and regulation of urges), *samyak gati* of *dhatus* (optimal movement of body tissues), and *patava* of *akshas* (sensory and cognitive acuity).¹⁰

The *Vata* as the controller of mechanical and dynamic function is comprised of *Prana*, *Udana*, *Samana*, *Vyana*, and *Apana*. It initiates the various movements, both upward and downward, and regulates as well as directs the mind. It is the activator of all the sense organs and the transporter of their sensory inputs. It organizes and structures all the bodily tissues, ensures their cohesion, and is responsible for the articulation of speech. It represents the fundamental nature of touch and sound, and serves as the basis for hearing and tactile sensation. It is the origin of joy and enthusiasm. *Samirana* (*Vayu*) supports *Agni* (digestive fire), dries up imbalanced doshas, and expels waste materials (external excretions) from the body. It penetrates both gross and subtle channels, shapes the structure of the fetus, and sustains life when in a balanced state.¹¹

Various subtypes of *Vata Dosha* are described based on their distinct physiological functions within the body. These subtypes, referred to as the *Panchavayus*, play integral roles in regulating different bodily systems. Each subtype governs specific functions and is associated with distinct locations and physiological activities, highlighting *Vata's* multifaceted role in maintaining systemic homeostasis and health. The five subtypes of *Vata* are : *Parana*, *Udana*, *Samana*, *Vyana*, *Apana* *vayu*.¹²

The cell is the structural and functional unit of the living body.¹³ Groups of cells form tissues, which in turn form organs. A system is a group of organs working together to perform specific bodily functions.¹⁴ The human body operates as an intricate network of systems, each with a distinct role, collectively ensuring health and functionality.

Table 1 : Few Systems of Human Body

S.no	System	Function
1	Nervous System	It is the body's control center, coordinating voluntary and involuntary actions and transmitting signals between different parts of the body.
2	Circulatory System	The circulatory system ensures the transport of oxygen, nutrients, and waste products throughout the body, maintaining homeostasis.
3	Respiratory System	The respiratory system is responsible for gas exchange, enabling the body to take in oxygen and expel carbon dioxide.
4	Digestive System	The digestive system breaks down food into nutrients, which are absorbed into the bloodstream to fuel the body.

5	Musculoskeletal System	The musculoskeletal system provides structure, support, and movement for the body. It comprises bones, muscles, tendons, and ligaments
6	Urinary System	Maintaining fluid balance and removing waste, it includes the kidneys, ureters, bladder, and urethra.
7	Reproductive System	This system ensures reproduction and genetic continuity.
8	Skeletal System	It supports structure, protects internal organs, stores minerals, and produces blood cells in bone marrow.

DISSCUSSION

According to Ayurveda, *vata dosha* is responsible for the overall rapid regulatory controlling system of the body. The various general functions of *vata* can be analysed critically on the basis of their functional similarities in the modern bodily systems.

Tantra- yantra dhara¹⁵. In this context, yantra can be understood as the organs, while tantra represents the body as a whole. The human body functions efficiently through the harmonious operation of its different systems, which is facilitated by the proper transmission of impulses through the nervous system. *Vata dosha* plays a crucial role in regulating and coordinating these physiological functions.

Chestanam Pravartaka¹⁶ refers to the initiation and regulation of bodily movements. *Vata dosha*, as the primary force behind motion, governs both voluntary and involuntary actions. Voluntary movements, such as those involving skeletal muscles, occur only when activated by motor impulses from the central nervous system, specifically through the cerebrospinal pathways. In contrast, involuntary actions are regulated by the autonomic nervous system, which controls functions like cardiac activity, digestion, and respiration without conscious effort. The integration of these systems ensures seamless coordination between conscious and subconscious motor functions, highlighting the fundamental role of *Vata dosha* in sustaining physiological movement and neuromuscular activity.

Niyanta Pranetha Cha Manasa¹⁷ refers to the role of *Vata dosha* as the initiator and regulator of mental functions. In physiological terms, the cerebrum, particularly the frontal lobe, governs higher cognitive processes such as thinking, reasoning, decision-making, and problem-solving. The prefrontal cortex (PFC), a crucial region within the frontal lobe, is responsible for executive functions including impulse control, social behavior, moral reasoning, and cognitive flexibility. *Vata dosha* is correlated with the neural impulses and neurotransmission that facilitate these cognitive processes. *Vata* drives the swift transmission of thoughts, mental agility, and adaptability, aligning with the rapid synaptic activity and neuroplasticity observed in higher-order brain functions.

Sarvendriyanam Udyojakah¹⁸ refers to *Vata dosha* as the coordinator and activator of sensory faculties. This function can be scientifically correlated with the role of neurotransmitters and synaptic activity in facilitating communication between sensory organs and the brain. Neurotransmitters such as dopamine and serotonin play a crucial role in sensory perception, emotional regulation, and motor coordination. Dopamine is involved in reward processing, motivation, and fine motor control, while serotonin modulates mood, cognition, and sensory integration. These neurochemical processes align with *Vata's* dynamic nature enabling efficient sensory perception and response. Just as *Vata* ensures the proper activation of the indriyas (sense organs), neurotransmitter activity maintains the rapid relay of information necessary for sensory processing and neural integration.

Sarvendriyarthanam Abhivodha¹⁸ refers to the transmission of sensory impulses. In modern physiology, this role can be correlated with the thalamus and cerebral cortex. The thalamus acts as a relay station, receiving sensory input from the external environment and directing it to the appropriate regions of the cerebral cortex for processing and interpretation. *Vata*, with its inherent qualities of movement and communication, mirrors this function by facilitating the rapid transmission of neural impulses between sensory organs and the brain.

Sarvashareeradhatu Vyuhakara¹⁹ refers to *Vata dosha's* role in organizing and maintaining bodily tissues. This function can be scientifically correlated with the body's homeostatic mechanisms, which regulate tissue growth, differentiation, repair, and regeneration. During development, signaling molecules such as growth factors guide cellular proliferation and specialization, ensuring proper tissue formation. *Vata* plays a crucial role in maintaining the dynamic balance between anabolism (the building up of tissues) and catabolism (the breakdown of tissues), a process largely influenced by circulatory and endocrine signaling pathways. *Vata* ensures the continuous remodeling and maintenance of body tissues, sustaining overall structural integrity and function.

Sharirasya Sandhanakara²⁰ refers to *Vata dosha's* role in maintaining the structural and functional integration of bodily tissues. This can be correlated with the autonomic nervous system (ANS), which regulates organ and tissue functions to ensure physiological coherence. The sympathetic division of the ANS enhances blood flow to muscles during activity, facilitating oxygen and nutrient delivery, while the parasympathetic division promotes digestion and nutrient assimilation, ensuring proper nourishment and maintenance of tissues. *Vata*, with its qualities of movement and coordination, governs these regulatory mechanisms by facilitating neural signaling, vascular dynamics, and tissue interactions.

Pravartako Vaaca²¹ refers to *Vata dosha's* role in initiating and facilitating speech. The physiology of speech production integrates multiple systems, including the nervous, respiratory, and musculoskeletal systems. Broca's area in the brain is responsible for motor planning of speech, while Wernicke's area handles language comprehension. *Vata*, particularly through the action of *Prana Vayu*, governs the initiation of speech by facilitating neural impulses from the brain to the vocal and respiratory apparatus. It regulates airflow from the lungs, coordinated by the diaphragm and intercostal muscles, which is essential for phonation. *Udana Vayu* controls the functioning of the larynx and vocal cords, while *Vyana Vayu* ensures the precise coordination of the muscles involved in articulation, such as the tongue, lips, and jaw. The cranial nerves transmit signals to these structures. *Vata* plays a crucial role in the timing and rhythmic control of respiratory muscles, enabling sustained and articulate speech.

Shrotra-Sparshanayormulam²² refers to *Vata dosha's* involvement in hearing and tactile sensations, which are rooted in the interaction of the *Akasa* (ether) and *Vayu* (air) mahabhootas, respectively. In the context of the somatosensory system, *Vata*, particularly *Prana Vayu* and *Vyana Vayu*, governs the transmission of sensory information. Mechanoreceptors in the skin detect tactile stimuli like pressure and vibration, while thermoreceptors sense temperature, and nociceptors respond to harmful stimuli. *Vata* facilitates the transmission of these signals through afferent neurons to the somatosensory cortex for perception. Similarly, in hearing, *Vata* governs the movement of sound waves through the auditory canal, the vibration of the tympanic membrane and ossicles, and the conversion of mechanical vibrations into electrical impulses in the cochlea. *Prana Vayu* supports the reception of auditory signals in the brainstem, while *Vyana Vayu* helps integrate and process sound in the auditory cortex, ensuring the coordination of sensory input and perception.

Harshotsaharyoni²³ refers to the function of *vata* being able to bring about a source of joy cheerfulness and enthusiasm. Balanced *Vata* plays a critical role in regulating neurotransmitter function, which underpins feelings of joy, enthusiasm, and alertness. It governs the processing of sensory inputs in the brain, causing harmonious sensory impressions that contribute to a cheerful and pleasant state of mind (*Harsha*). Additionally, *Vata* stimulates motor responses and physical activity, energizing the body to engage in actions that bring satisfaction and fulfillment (*Utsaha*). *Vata* also significantly influences stress adaptation through the hypothalamic-pituitary-adrenal (HPA) axis, regulating the body's stress response and maintaining

optimism and motivation. When *Vata* is balanced, it supports emotional stability and resilience, while imbalance can lead to anxiety, restlessness, and fear, disrupting these positive states and overall well-being

***Samirano agne*²⁴** means that *vata dosha* accelerates the secretion of digestive enzyme. *Vata* governs parasympathetic branch, which regulates the secretion of digestive enzymes. Signals from the brain via the vagus nerve stimulate the release of saliva, gastric juices, bile, and pancreatic enzymes essential for digestion. This aligns with *Vata*'s role as a driver of movement and stimulation in the body, ensuring the proper initiation and continuation of enzymatic activity in the gastrointestinal tract. Also *Vata* drives peristaltic movements, which facilitate the mixing of food with digestive enzymes, optimizing nutrient breakdown and absorption. *Vata* also influences the release of hormones like gastrin, secretin, and cholecystokinin (CCK), which regulate the secretion of digestive juices.

***Samshanodoshanam*²⁵**. *Vata* plays a key role in facilitating the absorption of nutrients in the gastrointestinal tract, ensuring the proper uptake of digested food molecules, such as glucose, amino acids, and fatty acids, into the bloodstream through the intestinal walls. This aligns with *Vata*'s function of movement and the distribution of nutrients to various tissues. In the large intestine (*Pakvashaya*), *Vata* governs the absorption of water and electrolytes, ensuring the drying and compaction of undigested food residues for elimination as stool, thus maintaining a balance between hydration and waste elimination. Additionally, *Vata* regulates drying and moisture balance in the respiratory tract, aiding in the removal of excess mucus to keep the airways clear for efficient gas exchange.

***Malanam Bahiskhepata*²⁶**, the function of *Vata Dosha* as waste excretion. The large intestine (*Pakvashaya*), a primary site of *Vata*, eliminates solid waste through peristalsis, regulated by the enteric nervous system (ENS) and neurotransmitters like acetylcholine and serotonin which modulate the gut motility. *Apana Vayu* governs defecation and also facilitates urine excretion where the autonomic nervous system (ANS) controls the micturition reflex for voluntary and involuntary urination. *Apana Vayu*'s role in the downward elimination of urine is comparable to the function of the detrusor muscle and internal/external sphincters in modern physiology. Similarly, the sweat glands, regulated by the sympathetic nervous system (SNS) and the hypothalamus, expel salts, urea, and toxins to maintain homeostasis.

***Srotasambheta*²⁷** refers to *vatas* ability to create the passageway and openings. During fetal development, vasculogenesis and angiogenesis establish the primary blood vessels, forming the circulatory system, which parallels the Ayurvedic concept of *Srotomoola* (origin of *srotas*) as the foundation of bodily channels. Simultaneously, neural tube formation gives rise to the central and peripheral nervous systems, ensuring communication pathways, while the differentiation of the endoderm leads to the development of major passageways, including the gastrointestinal, respiratory, and excretory tracts. These processes collectively create structured pathways essential for circulation, respiration, digestion, and excretion, aligning with the Ayurvedic understanding of *Srotasambheda* (formation of bodily channels).

***Garbhakritinam karta*²⁸** shows the role of *vata* in deciding the foetal form. The genetic code (DNA) inherited from both parents provides the structural blueprint for fetal development, while Hox genes (homeobox genes) regulate body segmentation, limb formation, and organ placement, ensuring the correct shape, symmetry, and proportion of the embryo. *Vata Dosha*, with its role in movement and cellular organization, parallels these genetic regulatory

***Ayusoanuvritti*²⁹** refers to the function of *Vata Dosha* in sustaining life, which aligns with the fundamental processes of homeostasis, energy production, and organ function in modern physiology. *Vata*'s role in sustaining life, can be understood in terms of its involvement in energy production, fluid regulation, neural coordination, respiratory and cardiovascular functions, and immune defense. In modern physiology, this corresponds to the body's ability to regulate vital functions, providing the energy and stability required for survival.

Ucchvasa- Nisvasakara³⁰, *Vata* regulates the respiration. The medulla oblongata, part of the brainstem, controls the basic rhythm of breathing, ensuring a steady intake of oxygen and release of carbon dioxide. *Vata's* connection to the nervous system ensures effective transmission of signals from the brainstem to the respiratory muscles, triggering the mechanical movements necessary for breathing. Additionally, *Vata* governs the sensory and motor pathways involved in controlling breath, including chemoreceptors that monitor oxygen and CO₂ levels in the blood and mechanoreceptors that detect lung stretch, adjusting the rate of breathing accordingly.

Rasa-Rakta Vikshepakara³¹ refers to *Vata's* role in regulating the circulation of *Rasa* (bodily fluids, including plasma and lymph) and *Rakta* (blood), ensuring their movement throughout the body. This can be understood as *Vata* playing a crucial role in regulating fluid dynamics, blood flow, and cardiovascular function, all of which are essential for maintaining homeostasis and bodily functions. The autonomic nervous system (ANS) plays a key role in regulating heart rate, blood pressure, and blood flow. *Vata*, in its capacity as a regulator of movement (*Chala Guna*), influences blood circulation by affecting the autonomic control of the heart and vasculature, ensuring the appropriate flow of blood to vital organs and tissues. *Vata's* influence on fluid dynamics reflects its role in ensuring the movement of *Rasa* (bodily fluids) to support nutrition, hydration, and waste removal. This is akin to the fluid transport mechanisms in the lymphatic system and the venous return of blood to the heart, maintaining fluid balance and tissue perfusion. *Vata*, by regulating the nervous system, contributes to the vasomotor tone, ensuring appropriate adjustments in blood vessel diameter and maintaining optimal blood flow, particularly in response to changes in physical activity or environmental conditions.

CONCLUSION

In conclusion, the function of *Vata dosha*, when examined through the lens of modern physiology, reveals remarkable parallels between ancient Ayurvedic principles and contemporary scientific understanding. *Vata*, described in Ayurveda as the governing force of movement and communication, plays a crucial role in various physiological processes that align with modern neurological and biochemical mechanisms. *Vata* controls the neural impulse transmission, both for sensation and for motion, in which electrical and chemical conduction is responsible for coordination between organ systems.

Moreover, *Vata* is responsible for both contraction and relaxation of the muscles, allowing for effective locomotion and spontaneous physiologic activity, including respiration and peristalsis. It is responsible for controlling cellular messaging, including neuro-transmission and hormonal activity, for a state of homeostasis. Besides, its role in circulation and nutrition in tissue reflects that of the autonomic nervous system in controlling cardiovascular and metabolic function. By connecting these concepts, one realizes that *Vata* in Ayurveda is not a mere metaphysical notion but a broad representation of the physiological processes within the body.

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