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Critical review on physiological aspects of *Samana Vata*

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ABSTRACT

Background: *Samana Vata* which is located near the seat of *Agni* and it have role in digestion as well as in the assimilation of ingested food. *Anna Grahana*, *Pachana*, *Vivechana* and *Munchan* are the functions of *Samana Vata.* The physiological functions of *Samana Vata* can be correlated with enteric nervous system which is known as the second brain, and parasympathetic and sympathetic supply of autonomic nervous system. ENS functions by maintaining the enteric homeostasis and also act as modulator in gut barrier functions. After the food reaches stomach, several digestive juice acts on it. Gastric juice, pancreatic juice, all contains important digestive enzymes and act on food. Secretion of this enzyme is mostly under the control of intrinsic and extrinsic enteric nervous system. **Aims and Objective:** To critically analyse the concept of *Samana Vata* and find out the correlation with modern physiology. **Materials and Methods:** Literature review was referred from different classical text books and relevant modern textbooks, articles, data bases like google scholar, pubmed. **Conclusion:** *Samana Vata* chiefly locates in the middle part of body. It is primarily responsible for stimulation of *Agni* and leads to digestion, absorption, separation of essence and waste material. Function of *Samana Vata*, described by Acharyas can be compared with the physiological function of enteric nervous system. It can be partially correlated with enteric nervous system, sympathetic and parasympathetic supply of autonomic nervous system.

Key words: *Samana Vata, Agni, Tridosha, ENS, ANS.*

INTRODUCTION

One of the important functions of the living being is the ingestion, digestion and assimilation of the food, to maintain the mass of the body. *Agni* (digestive fire) is the invariable agent in the process of digestion and metabolism. Vitiation of *Agni* is the chief cause for all disorders. The overall prevalence of gastrointestinal disorders in India is about 18% with significant regional variations. *Agni* plays a major role in the process of digestion and metabolism. According to *Ayurveda*, all types of diseases are due to *Mandagni* and *Kayachikitsa* is the branch of Ayurvedic science which deals and rests on the concept of *Jatharagni*.[1] *Samana Vata* promotes *Agni* but whenever *Samana Vata* is vitiated it also vitiates *Agni* and causes disease related to *Agnisada*.

Ayurveda explains concepts of *Dosha* (*Vata, Pitta* and *Kapha*) as chief theory related to the health and disease. The *Vata Dosha* is important *Dosha* which govern all type of movements, mental functions, brings compactness to the body, promotes speech, sensation and responsible for many other physiological functioning.[2] There are different types of *Vata Dosha* like *Prana Vata, Udana Vata, Samana Vata, Vyana Vata, Apana Vata.* All these five *Vata Doshas* have their different site as well as different functions. Among the

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five types of *Vata*, *Samana Vayu* has various functions which act at different level. It also performs its function with the help of *Prana Vata*, *Vyana Vata* and *Apana Vata*. These *Vatas* proper cooperate and coordinate to each other while performing physiological functions. So, there is a need of proper understanding the functions in modern prospective.

Aim and Objectives

To critically analyse the concept of *Samana Vata* and find out the correlation with modern physiology.

Materials and Methods

The review draws upon classical Ayurvedic texts like the *Brihattrayi (Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya)* and *Laghutrayi (Bhavaprakasha, Sharangadhara Samhita, Madhava Nidana*), alongside relevant online resources and scientific journals.

Review of Literature

The term *Samana* means "*Samanthad Koshte Samyak Samam Vaa Aniti Iti Samanah*" denotes prevalent all around or which equalises in to one whatever we eat.[3] *Samana Vata* is the one which is located near *Agni* and have role in digestion.[4]

There are different opinions on the location and functions of *Samana Vata*

1. *Samana Vayu* is located near *Agni* and it is confined to *Koshta*.[4]

Karma

- *Anna Grhana* (receives food into the gastrointestinal tract)
- *Pachana* (Digestion of ingested food)
- *Vivechana* (Separation of essence and waste)
- *Munchana* (propels to the later part of *Annavaha Srotas*)

2. *Samana Vata* located in both *Amashaya* and *Pakvashaya*, is associated with *Agni*.[5]

Karma

- *Annam Pachathi* (Digestion of food)
- Separates essence and waste
- Vitiation of *Samana Vata* causes *Gulma*, *Agnisada*, *Atisara* etc.

3. *Samana Vata* is located in the channels of *Sweda* (sweat), *Dosha* (humours) and *Ambu* (water) and lateral to the seat of *Agni*.[6]

Karma

- *Agni Balaprada* (Give strength to *Agni*).

4. *Samana Vata* is located near *Antharagni* (digestive fire). It moves inside the large intestine, stomach and small intestine, Channels of *Doshas*, *Mala*, *Sukra*, *Artava*, and *Ambu*.[7]

Karma[8]

- *Avalambana* (supporting)
- *Anna Dharana* (holding of food for proper digestion)
- *Pachana* (digestion)
- *Vivechana* (separation of essence and waste)
- *Kitta Adhonayana* (downward propulsion of waste products)

5. Navel is the prime location.[9]

Karma[10]

It is helpful in circulation of blood.

6. *Samana Vata* is located in the *Koshta*, the navel region, and it is associated with the *Agni*.[11]

Karma [12]

- Digests the food
- Transport to the duodenum
- Separates its products
- Helps the feces to the rectum after that *Apana Vayu* does its work.[13]

7. It is pervading all over the body.[14]

Karma

It helps in maintaining the coordination all over the body.

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Modern Science Aspect

Annam Grahnati

It means receiving and withholding the food in gastrointestinal tract. Within the digestive tract, *Prana Vata* governs the initial intake and holding of food (*Anna Grahana*). *Samana Vata* supports this by coordinating with *Prana Vata's* receiving function.

This process can be understood as Deglutition. It is the physiological process of swallowing the food. This is divided into three stages.[15]

a) Voluntary Stage

We use our tongue to consciously move food around in our mouth. The tongue muscles are controlled by the twelveth cranial nerve (hypoglossal nerve). As we chew and maneuver the food, our tongue pushes it upwards and backwards against the roof of our mouth, squeezing it towards the back of the throat.

b) Involuntary Pharyngeal Stage

Once the food is squeezed to the back of the mouth and throat (pharynx), it triggers special receptors in the lining. These receptors send signals through branches of three cranial nerves (trigeminal, glossopharyngeal, and ninth) to a processing centre in the brainstem (medulla oblongata). This centre then sends instructions back down through several cranial nerves (fifth, ninth, tenth, and twelfth) to coordinate the muscles in the throat and esophagus.

c) Esophageal Stage

The esophagus acts like a muscular tube that propels the food (now called a bolus) down to the stomach. This movement is achieved by waves of muscle contractions called peristalsis. There are two types of these waves:

- **Propulsive waves:** These push the bolus steadily down the esophagus.
- **Mixing waves:** These briefly churn the bolus to ensure everything is well-combined.

These waves are controlled by the esophagus's own nervous system, independent of the brain.

Annam Pachati:

Agni is the digestive fire responsible for breaking down food. *Samana Vata* supports *Agni's* function by stimulating it for efficient digestion and metabolism. Therefore, any factor aiding *Agni's* digestive and metabolic power falls under *Samana Vata's* "*Anna Pachana*" function.

The Enteric Nervous System: The enteric nervous system (ENS) is a complex network of neurons embedded within the wall of the gastrointestinal (GI) tract, extending from the esophagus to the anus.[16] Often referred to as the "second brain" due to its estimated 100 million neurons (surpassing the number in the spinal cord),[17] the ENS is responsible for a multitude of GI functions including motility and secretion.[16]

Two major interconnecting plexuses comprise the ENS: the myenteric plexus (Auerbach's plexus) and the submucosal plexus (Meissner's plexus). The myenteric plexus, situated between the longitudinal and circular muscle layers, orchestrates GI motility by regulating the tone, contractile strength, and propagation of peristaltic waves. This plexus integrates excitatory and inhibitory signals, with vasoactive intestinal polypeptide (VIP) acting as a key inhibitory neurotransmitter affecting sphincter relaxation.[18]

In contrast, the submucosal plexus resides within the submucosal layer and governs local functions such as secretion, absorption, and submucosal muscle contraction.[14] Sensory information from the intestinal epithelium projects to both enteric plexuses, as well as to prevertebral ganglia, spinal cord, and brainstem via the vagus nerve. This intricate network allows for both independent ENS function and modulation by the extrinsic autonomic nervous system (sympathetic and parasympathetic) to optimize GI activity.[16]

Autonomic Regulation of the Gastrointestinal Tract

The autonomic nervous system exerts significant control over gastrointestinal (GI) function through its parasympathetic and sympathetic divisions.[16] The cranial parasympathetic fibers innervate the esophagus, stomach, lungs, liver, gallbladder, heart,

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kidneys, pancreas, small intestine, and the proximal colon, extending to the upper ureter.[19] Descending colon, rectum, urinary bladder, and the lower ureter receive innervation from the sacral parasympathetic fibers.[19]. Notably, the postganglionic neurons of the GI parasympathetic system primarily reside within the myenteric and submucosal plexuses, where their stimulation enhances the activity of the enteric nervous system (ENS).[16]

In contrast, the sympathetic fibers innervating the GI tract originate in the thoracic spinal cord segments T1-T11.[20] While most preganglionic fibers synapse within the sympathetic chain, some travel directly to prevertebral ganglia like the celiac and mesenteric ganglia without synapsing.[20] These prevertebral ganglia then give rise to postganglionic fibers that innervate all regions of the gut. Stimulation of the sympathetic nervous system generally inhibits GI activity. This inhibition can occur through two mechanisms: 1) direct action of released norepinephrine on intestinal smooth muscle, causing contraction, and 2) an inhibitory effect of norepinephrine on ENS neurons.[16]

Annam Vivechayati

This explains the process of separation of essence and waste products from digested food and absorption of essence part of food, water, minerals etc. The small intestine serves as the primary site for nutrient absorption from digested food. This process involves a complex interplay between passive and active transport mechanisms.

Water and Electrolyte Absorption: The watery component of chyme, primarily consisting of water and electrolytes, is absorbed through the intestinal epithelium via osmosis.[21] This passive diffusion process occurs along a concentration gradient, where water moves from an area of low solute concentration (chyme) to an area of high solute concentration (bloodstream). Sodium (Na+) absorption plays a crucial role in overall water balance. Enterocytes (intestinal epithelial cells) actively transport Na+ from the lumen into the bloodstream using Na+/K+ ATPase pumps.[22] This creates an electrochemical gradient that facilitates the co-absorption of water and other solutes. In dehydrated individuals, aldosterone, a hormone secreted by the adrenal cortex, promotes Na+ retention in the kidneys and intestinal tract.[23] This helps restore blood volume and electrolyte balance.

Nutrient Absorption: Carbohydrate absorption primarily involves glucose, the end product of carbohydrate digestion. Enterocytes utilize sodium-glucose cotransporters (SGLTs) to actively transport glucose from the lumen into the bloodstream, coupled with the movement of Na+.[22] Similarly, amino acid absorption relies on sodium-amino acid cotransporters (SATs) that leverage the Na+ gradient to facilitate the passage of amino acids across the intestinal barrier.[22] Calcium absorption is tightly regulated by parathyroid hormone (PTH) released from the parathyroid glands. PTH stimulates intestinal calcium absorption by increasing the expression of calcium channels in the enterocyte membrane.[22]

Fat Absorption: Unlike water-soluble nutrients, fat digestion results in the formation of insoluble triglycerides. Here, bile salts produced by the liver emulsify fats into micelles, enhancing their solubility and facilitating their absorption across the intestinal epithelium.[21] Within the enterocyte, triglycerides are resynthesized and packaged into chylomicrons, lipoprotein particles specifically designed for transporting dietary fats through the lymphatic system to the bloodstream.

Munchati

It means throwing out waste products from the body i.e., fecal matters and urine. *Apana Vata* governs the elimination of waste products, including feces and urine. It's believed that *Samana Vata* plays a supportive role by initiating *Apana Vata's* function for expulsion. This coordinated activity between the two *Vata's* facilitates the removal of waste material from the body. Additionally, *Samana Vata* is thought to be involved in initiating both the defecation and micturition reflexes. Defecation and micturition are essential physiological processes that eliminate waste products from the body. These involve a complex interplay between the central nervous system, the

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enteric nervous system (ENS), and the peripheral nervous system.

Defecation: The urge to defecate arises when a mass movement in the colon propels feces into the rectum.[24] This rectal distension triggers a twofold reflex response:

1. **Intrinsic Reflex (Mediated by ENS):** Sensory signals initiated by the distended rectal wall travel through the myenteric plexus (a component of the ENS) to initiate peristalsis in the descending colon, sigmoid colon, and rectum.[24] These peristaltic waves promote fecal movement towards the anus and relaxation of the internal anal sphincter.
2. **Parasympathetic Reflex:** Upon rectal filling, nerve endings are stimulated, sending signals to the sacral spinal cord via the pelvic nerve.[24] The spinal cord then relays a reflex signal back to the descending colon, sigmoid colon, and rectum through the pelvic parasympathetic nerve fibers. This parasympathetic stimulation further intensifies peristalsis and relaxes the internal anal sphincter, facilitating defecation if the external anal sphincter is voluntarily relaxed.

Micturition: Micturition, the emptying of the urinary bladder, is primarily governed by a stretch reflex.[25] As the bladder fills with urine, stretch receptors in the bladder wall are activated. These receptors transmit sensory signals to the sacral segments of the spinal cord via the pelvic nerve. The spinal cord then initiates a reflex response, sending signals back to the bladder through parasympathetic nerve fibers. This parasympathetic stimulation triggers bladder muscle contraction (detrusor muscle) and relaxation of the internal urethral sphincter, leading to micturition.

Discussion

Ayurveda tells that *Samana Vata* governs various aspects of digestion, including food intake (*Anna Grahana*), digestion (*Anna Pachana*), separation of nutrients and waste (*Anna Vivechana*), and waste expulsion (*Munchana*). While the specific anatomical locations ascribed to *Samana Vata* in Ayurvedic texts vary, its functional role aligns with the complex interplay between the enteric nervous system (ENS), autonomic nervous system, and hormones in modern physiology. The initial stages of food intake (*Anna Grahana*) are likely mediated by the voluntary and involuntary phases of deglutition. The voluntary stage involves the tongue and hypoglossal nerve, while the involuntary stages involve coordinated actions of the trigeminal, glossopharyngeal, and vagus nerves, along with the brainstem. The esophageal stage of deglutition is controlled by the enteric nervous system's peristaltic waves. *Samana Vata's* role in supporting *Agni* (digestive fire) for efficient digestion (*Anna Pachana*) can be understood through the lens of the enteric nervous system (ENS). The ENS plays a crucial role in regulating GI motility and secretions through complex neural networks within the gut wall. The myenteric plexus orchestrates peristalsis, while the submucosal plexus governs local functions like secretion and absorption. The ENS also interacts with the extrinsic autonomic nervous system (sympathetic and parasympathetic) to optimize digestion. The separation of nutrients and waste products (*Anna Vivechana*) aligns with the absorptive processes in the small intestine. Modern science explains this process through the involvement of passive and active transport mechanisms, facilitated by sodium gradients and specific transporters like SGLTs and SATs for glucose and amino acids, respectively. Additionally, hormones like parathyroid hormone (PTH) regulate calcium absorption. The Ayurvedic concept of *Samana Vayu* influencing waste expulsion (*Munchana*) resonates with the coordinated actions of the ENS and the autonomic nervous system in defecation and micturition. When feces enter the rectum, a twofold reflex involving the ENS and the parasympathetic nervous system is triggered. The ENS initiates peristalsis in the colon and relaxes the internal anal sphincter, while the parasympathetic reflex further intensifies these actions for defecation. Similarly, micturition is governed by a stretch reflex mediated by the ENS and the parasympathetic nervous system, leading to bladder emptying.

Conclusion

While the precise location and functional scope of *Samana Vata* vary across Ayurvedic texts, its core

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function of stimulating *Agni* and facilitating digestion, absorption, and waste separation exhibits potential parallels with modern physiological concepts. The described actions of *Samana Vata* can be partially correlated with the enteric nervous system, the sympathetic nervous system, and the parasympathetic nervous system of ANS. These connections suggest that Ayurvedic concepts may offer a framework for understanding the interplay between the nervous system, hormones, and gut physiology in digestion and waste elimination.

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