wjpmr, 2025, 11(7), 111-115

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH
www.wjpmr.com

SJIF Impact Factor: 6.842

Review Article

ISSN (O): 2455-3301

ISSN (P): 3051-2557

A REVIEW ON PHYSIOLOGICAL ROLE OF *SAMANA VATA* IN DIGESTION VIS-A-VIS ENTERIC NERVOUS SYSTEM

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Article Received on 05/05/2025 **Article Revised on 27/05/2025** **Article Accepted on 16/06/2025**

ABSTRACT
Ayurveda is the ancient eternal science of life and longevity. It aims to maintain the health of healthy individuals and preventions of diseases.[1] In Ayurveda, health is defined as a state where *Doshas* (biological energies), *Agni* (digestive fire), *Dhatus* (tissues), waste products, and all physiological functions are in a harmonious and balanced state. Among these *Doshas, Vata* holds a pivotal role in both states of well-being and illness. Among five types of *Vata* that is *Prana, Udan, Samana, Vyan* and *Apaan Vayu*, the *Samana Vayu* is a vital force that is situated near *jatharagni* and primarily governs the digestion and absorption of food within the GI tract. 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. *Samana Vayu's* function encompasses stimulating *Agni* for efficient digestion, breaking down nutrients and facilitating the movement of food through the GI tract. It also works in conjunction with *Prana Vayu* to initiate food intake and *Apana Vayu* for waste expulsion.

KEYWORDS: *Samana Vata, Agni, Tridosha,* ENS, ANS.

INTRODUCTION
Vata dosha performs a variety of activities, including maintaining the function of organs and organ systems in their. natural state. *Vata* is the human body's initiating and governing element, as well as the cause of all types of movements.[2] According to *Acharya Sushruta, Samana vayu* is situated in *swedvaha srotas, doshavaha srotas* and *ambuvaha srotas* and gives strength *to agni (*digestive fire*) Samana Vayu*, a sub type of *Vata* situated proximate to the *Jatharagni* or digestive fire, traverses the entirety of the gastrointestinal tract (GIT). *Samana Vayu* stimulate the *Agni (Antragni)* to perform its catabolic action on the food, *Samana Vayu* also helps in initiation of food, stimulation of digestive secretion, absorption of essence part, gastrointestinal motility instigation of elimination of waste product through *Srotasa*. *Samana Vayu* described by *Acharya* can be compared with the physiological function of sympathetic nerve and para sympathetic which control the movement and secretion of GI tract. Peristaltic movement of GI tract controlled by Auerbach's plexus and regulation of secretary function and cause constriction of blood vessels of GI tract controlled by meissner plexus part of intrinsic and extrinsic nerve supply can be compared with the function of *Samana Vayu*.

AIM
To study the concept of *Samana Vayu* as per Ayurvedic Literature and analyze correlation between *Samana Vayu* and Enteric Nervous System.

MATERIAL AND METHODS
Study based on review of Classical Ayurvedic Texts, alongside modern literature, relevant online resources and published research articles.

LITERATURE REVIEW
A healthy person, as per Ayurveda, is one whose *Dosha, Agni, Dhatu* are in balance state, whose functional activities of the tissues and excretory products are normal and whose soul, senses and mind are in good health. A single substance or structure cannot adequately reflect a *Dosha*, and the concept of *Tridosha* is essentially only a notion. 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.[3] The term *Samana* means "*Samanthad Kosthe Samyak Samam Vaa Aniti, Iti Samanah*", which denotes prevalent all around or which equalizes into one whatever we eat.[4] *Samana Vayu* resides in the *Kostha*, digests the ingested food and produces *Dhatus* and *Malas*.[5] Its function is to balance, carry and controlling of the food.

Samana Vayu Sthana and _Karma_ as per various Ayurvedic Texts

***1. Charaka Samhita*[6]**

Sthana: Present in *Svedavaha Srotasa*, *Doshavaha* and *Ambuvaha Srotasa* and lateral to the seat of *Agni* (digestive fire).

Karma: *Agnivardhaka* i.e promoter of *Agni* and vitality, regulates the channels carrying sweat, waste matter and water. Digests food and separates its product; its vitiation causes *Agnisad, Gulma, Atisar* etc.

2. *Sushruta Samhita*[7]

Sthana: *Aamashaya* and *Pakvashaya*

Karma: Digests *Ahara* and separates its into *Saar and Kitta* parts, its vitiation causes *Agnisad, Gulma, Atisar* etc.

***3. Ashtanga Samgraha*[8]**

Sthana: Present near *Jatharagni* (digestive fire) and it travels all over the *Kostha* (GIT).

Karma: *Grahana, Pachana, Vivechana and Munchana* of ingested food.

4. *Ashtanga Hridaya*[9]

Sthana: Present near the digestive fire, moves inside the large intestine, stomach and small intestine, channels of the *Doshas, Malas* (waste), *Sukra* (reproductive tissue of male), *Artava* (menstrual fluid),ovum (the reproductive tissue of female), and *Ambu* (body fluid).

Karma: Holds food in the GI tract, digestion of food, separate it into *Saara* and *Kitta* and propels it further into the lower part of the intestine.

5. *Sharangdhara*[10]

Sthana: *Nabhi*(umbilicus) as the prime location.

Karma: The *Samana Vayu* is helpful in the circulation of blood.

6. *Bhavaprakash*[11]

Sthana: *Kostha*, the navel region, associated with *Agni*

Karma: Digests food, transport to the duodenum and separates its products and helps in the movement of faeces to the rectum.

7. *Bhela Samhita*[12]

Sthana: Present all over the body.

Karma: Maintains coordination in the entire body.

8. *Sharir Tatwa Darshnam Naam Vatadi Dosh Vigyanam*[13]

Sthana: Transmits through the subtle sources (*Sukshma Srotasas*) of the muscles in the intestine (*Kshudrantra*) and *Pakwashaya* (colon).

Karma: contraction and relaxation of the intestine, take the food from the stomach into the duodenum (*Pachyamanashaya*), stimulate the *Pachaka Pitta* present in the fluid form in the *Kshudrantra*, stimulates and carries *Sara Bhaga* to the liver and spleen by *Rasavaha Srotas* and carries the *Kitta Bhaga* (faeces and urine) to the *Pakwashaya* and *Mutrawaha Srotasas*, from *Pakwashaya* throws the *Purisha* (faeces) out of the body.[14]

9. *Vaidyakiyashubhashita Sahityama*[15]

Yoga Science

Sthana: *Manipura Chakra* (Solar plexus)

Karma: responsible for intestinal motility and digestive secretions (*Agni*).

AYURVEDIC TREATISE VIS A VIS MODERN CONCEPT

In Ayurveda, *Samana Vayu*, one of the five sub-types of *Vata Dosha*, is responsible for the digestion and assimilation of food. Specifically, *"Annam Grahanati"* (or *Anna Dharana*) refers to its role in receiving and retaining food within the stomach. *Samana Vayu* works in conjunction with *Pachaka Pitta* (digestive fire) and *Kledaka Kapha* (mucus in the stomach) to ensure proper digestion and absorption of nutrients.

In Modern perspective this process can be understood as Deglutition. It is the physiological process of swallowing the food. This is divided into three stages.[16] Deglutition, or swallowing, is the process of moving food from the mouth to the stomach, and it involves three main phases: the oral, pharyngeal, and esophageal phases.

1. Oral Phase

- **Oral Preparatory Stage:** Food is manipulated in the mouth, mixed with saliva, and chewed to form a bolus (a mass ready to be swallowed).
- **Oral Stage:** The tongue pushes the bolus to the back of the mouth towards the pharynx.

2. Pharyngeal Phase

- The soft palate elevates to close off the nasal passage.
- The larynx (voice box) moves upward and forward, and the epiglottis folds down to cover the trachea (windpipe).
- These actions prevent food from entering the airway and direct it into the esophagus.
- The pharyngeal muscles contract to propel the bolus into the esophagus.

3. Esophageal Phase

- The bolus enters the esophagus, a muscular tube connecting the pharynx to the stomach.
- Peristalsis, wave-like muscular contractions, moves the bolus down the esophagus.

- The upper and lower esophageal sphincters (muscular rings) relax to allow the bolus to pass through and then contract to prevent backflow.
- Finally, the bolus enters the stomach.

Annam Pachati refers to the digestive function of *Samana Vayu*. It is responsible for the proper digestion and assimilation of food, working in close conjunction with *Agni* (digestive fire). It stimulates *Agni*, facilitates the breakdown of nutrients, and aids in the movement of food through the gastrointestinal tract.

This function of *Samana Vayu* can be correlated with Enteric Nervous System. ENS is a vast network of neurons and glial cells embedded in the walls of the gastrointestinal (GI) tract. It's often referred to as the "second brain" due to its complexity and ability to function somewhat independently of the central nervous system (CNS). The ENS controls various digestive functions, including motility (movement of food through the gut), secretion of digestive enzymes and hormones, and blood flow to the GI tract.

Key Features of the ENS[16]

- **Location**

The ENS is located within the walls of the GI tract, extending from the esophagus to the rectum.

- **Complexity**

It contains roughly 100 million to 600 million neurons, comparable to the number in the spinal cord.

- **Function**

The ENS regulates digestion, absorption, and motility, and also plays a role in gut immunity and blood flow.

- **Independent Function**

While the ENS is connected to the CNS, it can function relatively autonomously, coordinating reflexes and responses within the GI tract without direct CNS input.

- **Neurotransmitters**

The ENS uses a wide variety of neurotransmitters and neuromodulators, similar to those found in the CNS, to communicate and coordinate its functions.

How the ENS Works

1. Sensory Input

Sensory neurons in the ENS detect changes in the GI tract, such as the presence of food, stretching of the gut wall, or chemical changes in the lumen.

2. Integration

Interneurons process this sensory information and relay it to motor neurons.

3. Motor Output

Motor neurons in the ENS control the muscles of the GI tract, causing contractions (motility) or relaxation, and also regulate the secretion of digestive fluids and hormones.

4. Communication with CNS

The ENS communicates with the CNS through the vagus nerve and other pathways, allowing for feedback and coordination between the gut and the brain.

In Ayurveda, *Annam Vivechayati* refers to the process where *Samana Vayu* separates the digested food into its essential, absorbable components and the waste products. This process can be best understood by knowing a complex interplay between passive and active transport mechanisms as described in modern texts.

Water and Electrolyte Absorption[17]: The watery component of chyme, primarily consisting of water and electrolytes, is absorbed through the intestinal epithelium via osmosis. 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. 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. 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+. 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. 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.

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. 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

Munchan refers to the expulsion of waste products. The *Mutra* and *Purish* are expelled mainly by *Apana Vayu.*[18] However, its initiation is governed by the activity of *Saman Vayu*. Thus, *Saman Vayu* collaborates with *Apana Vayu* and expels the *Kitta* portion from the body.

Munchan Karma of Samana Vata can be correlated with 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 enteric nervous system (ENS), and the peripheral nervous system.

Defecation[19]: The urge to defecate arises when a mass movement in the colon propels faeces into the rectum. 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. 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. 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. 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 AND CONCLUSION

The functional area of *Saman Vayu* lies nearer to the *Jatharagni* and is, therefore, responsible for its stimulation (*Agnibalpada*). The process of ingestion is performed by *Saman Vayu* in coordination with *Prana Vayu*. The muscle contraction leading to smooth GI motility is due to the collaboration of Saman and Vyan together. The enzymatic activity along with the secretions require Pachaka Pitta which is greatly influenced by Samana Vayu itself. Vivechan being the most important karma of *Samana* is later assisted by *Apana Vayu* that results in the expulsion of waste products. Thus, the coordination of all the functional entities is required at the optimum level.

The gut–brain interaction is the communication between the ENS and autonomic nervous system (ANS). Although the ENS can function independently, its interaction with the ANS can greatly influence the GI functions. The physiology of *Samana Vayu* is somewhat similar to the functioning of the second brain, i.e., the ENS, in terms of gastric motility, absorption, and secretion. The known fact is that *Samana Vayu* provides strength to the digestive fire and helps in digestion. Similarly, the ENS controls the enzymatic activities, gastric secretions, and motility. Thus, a functional similarity can be drawn between the two. Ayurveda is vast, so much so that it cannot be defined under one single term. An attempt has been made here to show functional similarities between the two which needs more research in its area in the upcoming years.

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