RESEARCH PAPER

An extended review about the Pachkagni (Digestive fire) and Saman Vayu in relation to Grahani – an insight to the Enteric Nervous System.

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ABSTRACT

Background: According to Charaka, Pachkagni (Digestive fire) is the principal site of digestion and responsible for all the metabolic activities of body. Further, Saman Vayu have its Sancharsthana (area) in koshtha (Gastrointestinal Tract) and exhibiting its functions as Grahana, Pachana, Vivechana, and Munchana of Anna Dravya (food). In Ayurveda, the position of Saman Vayu is situated exactly proximate to the Pachkagni or Jathragni which corelates with the digestive fire or metabolism and control the bowel movements of the entire tract of the intestine, i.e., Gastrointestinal tract (GIT) [1].

Methodology: The present review is based on the extended review of Classical Ayurvedic text literatures, modern scientific text literatures, published research articles and relevant online material (PubMed, Scopus, Web of Science) to review the functional aspects of Pachkagni (Digestive fire) and Saman Vayu in the process of Grahani for proper understanding of Digestion with physiological activity of sympathetic and parasympathetic neural system of ENS and ANS in the lumen of Gut in GIT, as defined in Ayurvedic literature as understood in contemporary biomedical science.

Result: The main functions of Saman Vayu comprises of stimulating the Pachkagni fare enough for the efficient digestion, resulting in the catabolic activity of digestion and facilitating the bowel movement of gastrointestinal muscle fibres till expulsion of waste out of the body. Particularly, the corelation of Saman Vayu can be compared with the coordination of Enteric Nervous System (ENS) of the muscle activities of the wall of intestine, which functionalize the entire Gastrointestinal tract (GIT) and Autonomic Nervous System (ANS) through both of its parasympathetic and sympathetic pathways.

Discussion: The acknowledgment of the functions of Pachkagni and Saman Vayu with Grahani, exhibit new perspectives for contemporary research scholars and Ayurvedic practitioners. It basically emphasises over the highlights to keep Saman Vayu in balance condition to establish the optimum digestive function and well-being. The activity of Saman Vayu, which exhibit the coordination and harmony of various metabolic physiological functions like digestion, catabolism, absorption, excretion and various other activities of Gastrointestinal tract (GIT) in alliance with Enteric Nervous System (ENS) and Autonomic Nervous System (ANS). The stimulation of Pachakgni, is reported by consuming diets rich in proteins, lipids and fats thereby it facilitates the digestion and the movement across lumen of GIT...

Keywords: Pachkagni, Saman Vayu, Grahani, GIT, ENS, ANS....

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INTRODUCTION

According to Sushruta, the definition of healthy implies, when the Dosha, Agni, Dhatus, Mala and other physiological systems remains in the state of homeostasis along with the soul, sense and mind in state of equilibrium [2]. According to Ayurveda, Dosha, Dhatu, Mala and Pachkagni, are considered to be the main constituents of the body which control the entire metabolic activities of the human body. The concept of Pachkagni (Digestive fire) is very crucial in maintaining the homeostasis of body, its functioning, digestion and metabolism. According to Charaka, the functional seat of Agni or Pachkagni, is called as "Grahani" since it receives and withholds the food for digestion in GIT. The main function of Grahani is to nurture the Pachkagni, which is deeply required for the digestion of food and Saman Vayu supports it in the process of digestion and transporting the excretory products towards Pakwashaya (Anus), exhibiting its harmony in collaboration with enteric nervous system.

Among Doshas, Vata or Vayu Dosha is considered the most powerful to direct and regulate human body physiology and the cause of all types of movements at cellular level, so it is also referred as "Yantra dhara" [3]. It also controls and modulates the all types of sensory and cerebral functions of the brain. The Saman Vayu is located close to the Grahani and serves to boost the Pachkagni in performing Anna Pachana, as well as the actions like Grahana, Pachana, Vivechana, and Munchana of Anna Dravya. Its Sancharsthana, or effective area, is Kostha (Gastrointestinal Tract). It also aids in smooth functioning of process like digestion, secretion of digestive enzymes, absorption of absorbable essence, GI motility to promote the elimination

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of excretory waste out of body via Srotasa (Tract). The activities of Saman Vayu are corelated with physiological activity of sympathetic and parasympathetic neural system of ENS and ANS in the lumen of Gut in GIT. The Peristaltic movement by ENS in GI tract, are controlled by Auerbach's plexus or Myentric plexus and regulation of secretary function and cause constriction of blood vessels of GI tract controlled by Submucous plexus or meissner plexus part of intrinsic and extrinsic nerve supply can be compared with the function of Saman Vayu.

The term "Grahani" refers to the section of the small intestine at the duodenum that is also considered the activity site of Pachkagni. The ingested food is contained and withheld in the duodenum. As long as the digestive fire performs its function of chemical digestion, the food particles remained in the site of Grahani. The food particles are not propelled to the next stage or level of the intestine until the completion of its digestion, so it is known as "Grahani" [4]. The Grahani in GIT, is the site or place where actual digestion process executed, starting from the mouth, esophagus, stomach and small intestine, the entire tract of digestion is GIT (Annavaha Srotasa) in Ayurveda where the term "srotasa" means a tract or conduit and "Anna" refers for the food. The distal part of GIT which includes the large intestine, rectum and anus, is referred as "Purishavaha Srotas" in Ayurveda. The waste or stools or excretory part of food, is eliminated after completion of digestion is referred as "Purisha". Both "Annavaha Srotas" and "Purishavaha Srotas" constitute the complete GIT in Ayurveda.

Methodology:

The present review is based on the extended review of Classical Ayurvedic text literatures, modern scientific text literatures, published research articles and relevant online material (PubMed, Scopus, Web of Science) to review the functional aspects of Pachkagni (Digestive fire) and Saman Vayu in the process of Grahani for proper understanding of Digestion with physiological activity of sympathetic and parasympathetic neural system of ENS and ANS in the lumen of Gut in GIT, as defined in Ayurvedic literature as understood in contemporary biomedical science.

In modern medicine, contemporary and integrative scientific literature was searched from research publications detailing the Digestion, metabolism, immunity, homeostasis physiological activity ENS, sympathetic and parasympathetic neural system ANS and Gastrointestinal tract (GIT). These references were collected to understand the digestion physiology, Gut-brain axis and their role in Gastrointestinal disease. Attention is given on compiling the functional process of digestion, gut signalling and ENS-ANS interactions rather on understanding the GIT only. This present review doesn't follow PRISMA guidelines, since it is purely conceptual and descriptive in nature.

Neither clinical nor experimental or any lab-based interventions were adopted during this entire study. The research work does not include any primary data collection, patient outcomes, or any sort of statistical analyses. Since, it presents an academic and hypothetical based interpretation inclined towards future conceptual and interdisciplinary research exploration in the field of classical Ayurvedic and integrative Gastrointestinal science.

Review of Literature:

Pachkagni (Digestive fire)

In Ayurveda, the importance of Pachkagni is described in detail more than mere involvement in digestion, since it is extensively linked with the various physiological and metabolic activity of human body. According to Ayurveda, Agni or Pachkagni is responsible for all the activities of body like strength (Bala), complexion (Varna), health (Swasthya), enthusiasm (Utsaha), body development (Upachaya), complexion (Prabha), immunity (Ojas), vitality (Tejas), age (Vaya) and even life itself (Ayu). The normal power of Pachkagni facilitates the proper digestion of food, ensuring the necessary nutrients for maintenance and nourishment of the body's tissues (dhatus), which contribute to the overall health and vitality of body, in terms of strength, complexion and immunity. The diminished power of Pachkagni hampers the digestion and assimilation of nutrients, which results in improper health of body. According to Sushruta, Pachkagni is considered to be equivalent to God due to its miraculous nature and action in transformation of the metabolic activity of body [5]. According to Astanga Samgraha, the Pachkagni in Grahani with its excess quality of tejas element and devoid of liquid quality, referred as 'Anala' because of its ability of Paka or digestion [6]. According to Modern System of medicine, the different digestive enzymes and juices corresponding to the GIT, which are involved in the catabolism of complex food particle into their simpler units like Protein into amino acid, carbohydrate into glucose and fats into fatty acid and glycerol, so they may be transformed to be absorbed by intestine [7]. According to modern system of medicine, this activity can be correlated as –

Vagus nerve (Saman Vayu) – After ingestion of food, it stimulates digestive enzymes (Pachkagni) to complete the process of digestion and thus, metabolism occur.

Various other factors – stimulate the inactive enzymes in liver into an active form of enzymes to facilitate the process of digestion.

After ingestion of food – the stretch nerve receptor stimulates a spate of digestive secretion, necessary for the catabolic activity of food.

Pachkagni (Digestive fire) and Saman Vayu

In Ayurvedic Physiology, Pachkagni or Jathragni is considered as the bio-transformer of the human body at cellular level. The term 'Sama' is frequently used with 'Agni' refers to collaboration of Saman Vayu, which shows the conjugation of Saman Vayu with Agni since it stimulates or assists Agni to assist digestion. If Saman Vayu remains in its proper position i.e., in the naval region, the Pachkagni (digestive fire) keeps itself balanced position [8]. but, when Saman Vayu, is vitiated from its normal position, immediately Pachkagni also disturbed in its performance [9]. The disturbed Pachkagni (digestive enzyme secretions)

results in disturbed food digestion, which causes limitations in absorption and irregularities at tissue level. Pachkagni collaborate with Saman Vayu for appropriate food intake, ensures proper digestion and maintains tissue balance [10]. So, Pachkagni must remain in normal position, well supported with Saman Vayu for maintaining tissue balance for optimum Digestion and metabolism.

Saman Vayu:

According to Vagbhat, Saman Vayu is responsible for the complete process of digestion, involving ingestion (Grahana), digestion (Pachana), assimilation (Vivechana), and excretion (Munchana). This complete process of transformation of ingested food into absorbable essence is considered as "Pachana" or Digestion, which is well recognized process in the system of modern science. The Saman Vayu is sited near to Pachkagni at its Sancharsthana (effective area) as Kostha (Gastrointestinal Tract) [11]. It basically supports Pachkagni to perform functions like Grahana, Pachana, Vivechana, and Munchana of Anna Dravya [12]. In system of modern science, the secretory enzymes, hormones, transmitting neurons, and other components in the digestion at GIT, have also been studied extensively. In the physiology of digestion, the role of Saman Vayu, is specified in the regulation of Pachkagni and consequent absorption of digested food products, duly followed by the process of micturition and excretion in the effective area of Grahani in collaboration with the ENS. The ENS exhibits very important role in the functioning of Grahani, since it governs the intestinal secretion and movements in response to nerve conduction received within the lumen of GIT. There are around 100 million of Neurons involves in the nerve conduction of the ENS as a result of stimuli received across the reflex pathways, which respond against the activity of sensory receptors like stretch receptors and chemoreceptors. The sensory neurons of these signal receptors found within the structure of ENS actually coordinating with the central nervous system (CNS) and autonomic nervous system (ANS) with the physiological activity of its sympathetic and parasympathetic nerve fibres, exerting contraction and distension of the GIT accordingly.

Functions of the Saman Vayu

The functional activities of the Saman Vayu, are characterized as Annam Grahanati, Annam Pachati, Annam Vivechayati and Annam Munchati. These activities account for all the step-by-step sequential activities started after intake of food by human body, explaining the complete process of digestion in the GIT starting from mouth to excretion out of body in a well-coordinated systema. The physiological corelation of the individual activity of Saman Vayu in similarity with the six steps of Digestion according to system of modern medicine as:

Annama Grahnati (Deglutition and Retention of Food)

It involves receiving and withholding of ingested food in GIT. Actually, the Grahana of Anna is the function of Prana Vayu, but Saman Vayu in coordination with Prana Vayu, helps in receiving food. In actual, Deglutition is a complicated mechanism and involves 3 stages as:

Stage of swallowing: It is a voluntary stage done by individual advertently. The tongue exerts pressure upward and backward against the palate, resulting in squeezing of ingested food inside towards pharynx posteriorly. The nerve supply to the muscles of tongue is 12th cranial nerve (hypoglossal nerve).

Pharyngeal stage of swallowing: It is an Involuntary stage executed by pharynx itself inadvertently. After ingestion of food, squeezing of food to make bolus form is done by mandibular muscles in the posterior part of mouth, anterior to pharynx. This muscular activity stimulates the epithelia of the swallowing receptor around pharynx. Further sensory impulses of trigeminal and glossopharyngeal nerve fibres, are transmitted into medulla oblongata. While, the motor impulses from the swallowing centre, are transmitted by 5th, 9th, 10th, 12th cranial nerves across the muscle fibres of pharynx and oesophagus.

Oesophageal stage of swallowing: It is an Involuntary stage executed by oesophagus itself inadvertently. Its primary function is to push or transfer the bolus formed food from the pharynx to stomach simultaneously. It performs basically two types of peristaltic movement i.e., propulsive movements and mixing movements. These peristaltic movements are acting synergistically in wave pattern. The activities of these movements, are stimulated and controlled by the intrinsic neural circuits of the Myenteric Nervous system [13].

Annam Pachati (Digestion of Food)

The proper digestion and metabolism of ingested food by an individual, is the main action of Pachkagni and the process of this activity is known as "Anna Pachana". The physiological function of Saman Vayu is to stimulate the Pachkagni to perform the process of proper digestion and metabolism. Thus, all the factors responsible for stimulation and initiation of digestion and metabolism comes under the activity of Saman Vayu as "Annam Pachati". So, the harmony between the Enteric Nervous System (ENS) and autonomic nervous system (ANS) through its sympathetic and parasympathetic nerve fibres, exerting contraction and distension of the GIT, is the main activity to be detailed under this function of Saman Vayu.

Annam Vivechayati (Separation and Absorption of Food)

This part of digestion occurs throughout the intestine, which comprises of separation of the "Sara bhag" (essence) and "Kitta bhag" (excretory waste) portion from the digested food and the process of separation is known as "Anna Vivechana". The essential micronutrients and minerals along with water, are absorbed across the intestine, while waste products like faeces and urine are expelled out from the body. The peristaltic movements of the bowel segment muscle contractions, across the lumen, happens throughout the intestine, followed by the centralized muscle

contractions to propel chyme forward and backward. This sort of continuous intestinal churning persists till the presence of nutrients, remains in intestine for absorption. ENS governs all these actions through neural control and has ability to act independent of central nervous system, since it acts as Second brain in GIT.

The peristaltic movements are also affected by the disturbances in neural control, which can result into faeces accumulation and fermented gases across Anus. This can also lead in the absorption of undigested toxins, which can manifest as the systemic and local nervous system disturbances across the lumen of GIT. The process of faeces formation is correlated with traditional concepts of "Purisha" formation in Ayurveda, where digested food consisting of essential vitamins and minerals, are readily absorbed across the lumen of GIT. In large intestine, the water is radially absorbed further to consolidate the chyme part into solid faeces with absorption of additional salt and water, which finally results into "Purisha" formation for excretion through Anus. The consistency of faecal matter is greatly depending on the quantity of water absorption, which is largely influenced by GIT motility and consumption of diet intake.

Annam Munchati (Expulsion of Waste)

According to Ayurveda, the expulsion of waste out through "Pakwashaya" (Anus), is majorly stimulated by Saman Vayu in collaboration with Apana Vayu. Actually, Saman Vayu triggers or collaborates with Apana Vayu to facilitate waste removal, like the expulsion of faeces and urine out of the body. When the stomach expands with fulness of ingested food, it initiates the muscle contractions across rectum, stimulating the urge to defecate the faecal matter out of Anus. This stimulus is referred as the gastrocolic reflex, which is stimulated by gastrin's action in the part of colon. Saman Vayu collaborates with ENS, in managing the gastrointestinal reflex pathways, which control the gastrointestinal secretion, peristaltic movements and bowel contractions. This stimulus entirely comprises of reflexes across the lumen of Gut, starting from the Gut to the sympathetic ganglia, reverse reflexes like the gastrocolic, enterogastric, colonoileal reflexes etc. and from the Gut to the spinal cord or brain stem, regulating gastric motor activity, secretion and the defecation reflex. The large intestine across its entire length, plays a very important role in reabsorption of micronutrients dissolved in water of digested portion and propulsion of other solid substances from waste faeces. The rate of movement from the caecum to the transverse colon across the length of large intestine occurs at very slow speed, since it allows ample quantity of time needed for water absorption, transforming digested food material into a sludgy paste.

The Parasympathetic enteric neurons stimulate the defecation, providing extensive stimulation to the sigmoid, colon, rectum, and anus of GIT. Saman Vayu has its effective area only within the Kostha (GIT), regulating digestion and the absorption of body fluids (Sara Kitta Vivechana). The excretion of waste faecal out of body, is mainly governed by Apana Vayu but in coordination with Saman Vayu. When waste faeces enter the portion of rectum, distension of the muscle fibres of rectal wall initiates the reflexes through the myenteric plexus (Saman Vayu), originating the peristaltic waves in the descending colon, sigmoid, and rectum to propel the waste faeces toward the anus. After initiation of the peristaltic movements, towards the anus, the internal anal sphincter relaxes due to inhibitory signals from the myenteric plexus, while voluntary relaxation of the external anal sphincter (Apana Vayu) occurs simultaneously to facilitate the easy process of defecation [14]. Since the intrinsic myenteric defecation reflexes are comparatively weak, so a strong parasympathetic reflex involving the sacral spinal cord segment initiates for efficient defecation. The Neural response from the ENS (Saman Vayu), sympathetic and parasympathetic nerve fibres from central nervous system (Prana Vayu) and ANS (Vyana Vayu) subsequently activate or inhibit gastrointestinal glands and smooth muscle, thereby stimulating the secretion and motility across the entire GIT.

Defecation:[15]

When the waste products move inside colon after absorption of essence, it forces the faecal matter towards the rectum, which response in initiation of an urge to defecate the faeces out of Anus, is referred as Defecation. This urge of defecation or rectal distension stimulated by a two-fold reflex response as:

Intrinsic Reflex: These reflexes are originated through the myenteric plexus of ENS, where the sensory nerve signals are originated by the distended rectal wall transmitting to start peristaltic movements starting from the descending colon, sigmoid colon and finally to rectum. This peristalsis propels the waste faeces movements towards the rectum by the smooth relaxation of the internal anal sphincter.

Parasympathetic Reflex: Once the rectum is filled with the excretory product, it stimulates the parasympathetic nerve supply, which forwards the neural reflexes towards the sacral spinal cord via pelvic nerve. The spinal cord further responds by sending a back signal towards the descending colon, sigmoid colon and rectum pelvic parasympathetic nerve fibers. This stimulation of parasympathetic nerve reflex further stimulates the peristaltic movements by relaxing the internal anal sphincter, which finally ease the process of defecation, if the external anal sphincter is voluntarily relaxed or opened by contracting the pelvic muscles.

Micturition:

The process of emptying the urinary bladder by contracting the muscle of urinary bladder, which is primarily initiated by a stretch reflex, is referred as Micturition. Once the urinary bladder is completely filled with urine, the stretch nerve receptors inside the wall of bladder becomes active. These stretch nerve receptors basically convey sensory nerve signals to the sacral segment of the spinal cord through pelvic nerve. The spinal cord responds against the

said reflex, by passing the reflexes signals back towards the urinary bladder via its parasympathetic nerve supply. This parasympathetic nerve supply initiates the contraction of urinary bladder muscle (detrusor muscle) and simultaneous relaxation of its internal urethral sphincter, which finally results to micturition.

Grahani:

According to Vagbhata, Grahani is the Sixth Pitta Dhara Kala, which is situated between Pakwashaya (the intestine) and Amashaya (the stomach) as the central site of internal digestion [16]. In Ayurveda, Grahani is the specialized part or portion of Mahasrotas (Alimentary canal). Although according to Sushruta, Kshudranta (small intestine) is the organ which corelates anatomically with Grahani, which is situated between the Amashaya (stomach) and Pakwashaya (colon). As per the operative site of Pachakagni, which helps in the process of Ahara Pachana, is situated in the small intestine or Grahani [17]. Till the final activity of Agni Mahabhut of Pachkagni, the digestive fire and chemical secretion for digestion, the food particles remians in the Grahani. According to Ayurveda, Grahani and Pachkagni maintain the Adhara Adheya Sambandha. Basically, it sustained and withholds the passage of ingested food from stomach into intestine, to complete the process of digestion. Because of its function to keep the ingested food till digestion, it is known as Grahani i.e., organ which has capacity to withhold the food till completion of digestion. The Pachkagni functions as the bio-transformer of this entire metabolism at the site of Grahani [18]. In the system of modern medicine, Grahani is correlated with small intestine, where actually the bile juice from liver and pancreatic juices from pancreas, secretes their digestive secretion into the ingested food received from stomach. This entire process of digestion is mirrored with the activity of Pachkagni inside Grahani. The major part of digestion completed in the small intestine only. The excretory or waste food part which remains after the complete digestion and separation of essence part, is sent from the small intestine to the large intestine for excretion.

Enteric Nervous System (ENS)

The ENS is the channel of systemic nerve coordination between the muscle fibres of Gut for synchronous nerve conduction and controlled bowel movement of GIT, which is found in the inner lining of Gastrointestinal tract area starting from the oesophagus to anus. In ENS, approximately 100 million neurons, exists across the lumen of GIT. It is also controlling the activity of gastrointestinal movement and their secretion. Actually, the ENS consists of mainly two plexuses as:

Auerbach's plexus or Myentric plexus – It is basically the outer plexus, which is present between longitudinal and circular muscle fibers. It controls the gastrointestinal movement.

Submucous plexus or Meissner's plexus – It is basically the inner plexus, which is present in the submucosa. It controls the gastrointestinal secretion and local blood flow.

The extrinsic sympathetic and parasympathetic nerve fibers of ANS, are coordinating with the myentric and submucosal plexus simultaneously in synchronised pattern. Although ENS has capacity to function independently without the stimulation of ANS, but the stimulation of both the system enhances the performance gastrointestinal function respectively [19]. The sensory nerve fibers present inside the epithelia of intestinal wall, send afferent nerve fibers towards starting from both the plexus to prevertebral ganglia of sympathetic nervous system, then spinal cord, vagus nerves and finally to the main brain stem. The muscle activity across the lumen of GIT is controlled by the Myentric plexus. On receiving the stimulation, it enhances the nerve conduction in the muscle fibers of the Gut lumen, frequency of synchronous muscle contractions, the velocity of nerve conduction of excitatory waves pattern across the wall of intestine, results in rapid bowel movement. Few signal neurons of myentric plexus are inhibitory in nature due to inhibitory transmission of vasoactive intestinal polypeptides chemical secreted by its neuron channels. These signals are generated to perform two major functions as:

It inhibits the opening of pyloric sphincter to prevent the emptying of stomach into the duodenum

It inhibits the opening of ileocecal sphincter to prevent the emptying of small intestine to cecum.

The submucosal neural plexus controls the action of muscle fibres within the inner wall of Gut lumen of every minute segment inside GIT i.e., control of local gastrointestinal secretion, absorption across the mucosa and contraction of the submucosal muscle of GIT [20]. The Neurons of ENS are comprising of the neural fibers from myentric and mesenteric plexuses in two layers, which are already in coordination with the ANS through its parasympathetic and sympathetic nervous systems as:

Sympathetic Nerves supply – Preganglionic fibres are emerging out from the lateral horn of spinal cord between T5 and L2 to merge with the celiac ganglia and mesenteric ganglia which further merge with the postganglionic neural fibres arise and finally scattered across the lumen of GIT.

Para Sympathetic Nerves supply – These fibres are emerging out from the cranial nerves and sacral nerves. The parasympathetic nerve fibers supplying the mouth and salivary glands, are emerging from the facial nerve and glossopharyngeal nerve. While, the parasympathetic nerve fibres supplying the oesophagus, stomach, small intestine and upper part of the large intestine, are emerging from the Vagus nerve. The parasympathetic nerve fibres supplying the Lower part of the large intestine and rectum, are emerging from S2, S3, S4 segments.

Result:

Finally, the outcome of this research explored the comprehensive correlation between physiology of Pachkagni and Saman Vayu with Grahani to explore its relatability with enteric nervous system (ENS). In the view

of proper digestion and nutrient absorption across intestine, the main function of Saman Vayu, is to stimulate the Pachkagni, the digestive fire. After thoroughly reviewing the textbooks, journals, literatures of Ayurveda and modern science, it is analysed that Saman Vayu lies in close vicinity to Pachkagni and functions at the site of Grahani to manage the entire digestive system. In coordination with ENS, it manages ingestion, digestion, separation, and excretion of waste products, exhibiting its properties like Grahana, Pachana, Vivechana and Munchana during digestion. Diminished activity of Saman Vayu, results in Pachkagni imbalance, which further cause disturbances in Pachkagni and variety of digestive issues. So, the need of keeping Pachkagni and Saman Vayu in balanced condition, is deeply required for the proper functioning of Grahnai to perform optimum digestive function and general health. The further understanding of the deep mechanism behind the functioning of Pachkagni and Saman Vayu, exhibits greater impact over the physiological activity of Grahani particularly in reference to digestion and nerve conduction through ENS. The scope of understanding the Digestion and ENS may be possible with further innovation and better research in this field, which is opening the specified area for more specified research strategies for the better understating of human metabolism. In extended view, the present study succeeds to establish how Ayurveda treats digestion with paranoic approach and exerts more attention towards the crucial aspect of comprehending the contribution of Pachkagni and Saman Vayu with Grahani and ENS in the field of digestive health and wellbeing at individual level.

Discussion:

The references mentioned in ancient Ayurvedic text books and other research papers about Pachkagni and Saman Vayu and its physiology to the control the Grahani (small intestine) with an insight about the enteric nervous system, extends a very border scope in the view of the digestion and metabolism. The balanced activity of Pachkagni results in good digestion and absorption of nutritional essence of food and excretion of the waste products out of body. If Pachkagni is not working in its normal condition, the digestion of food will be inadequate, which further results into the formation of pathology or disease condition, which may further convert into Gastrointestinal Disease, if not treated in proper timeline. Among all types of Vayu Dosha, Saman Vayu, is very essential for proper food digestion and absorption. It is located in the naval region near Grahani and is said to be responsible for the preservation of the physiological status of Pachkagni's (the digestive fire).

As per Ayurveda, mostly all type of digestion occurs in the Grahani (small intestine), which is considered as the main site of Pachkagni functioning. The functions of Pachkagni and Saman Vayu have close similarity in their nature of working, since the Saman Vayu regulates the intake, digestion, separation, and excretion of food products, along with the other digestive processes of metabolism. The complex relationship among Pachkagni, Saman Vayu and Grahani is well elaborated in the ancient Ayurvedic text books and references. The main functional are of Saman Vayu and Grahni is the Kostha (gastrointestinal tract) Which lies very close to the Pachkagni (digestive fire). It is very necessary component for proper nutrient absorption during the process of digestion. In its excellent working condition, Saman Vayu manage food to pass through the process of catabolism, ensuring further breaking down food particles into minute absorbable components so that they can be absorbed through large intestine to provide strength and nutrition to the body.

The main source of interaction between Gut–brain, is the neural conduction between the ENS and ANS. Although the ENS is considered as the second brain of GIT, since it can function independently. The GIT functions have great impact over its interaction with the ANS. In Ayurveda, the physiology of Saman Vayu is mirrored with the functioning of the ENS, in terms of gastric secretion, motility, absorption, and excretion. So, the physiological similarity may be drawn among Pachkagni, Saman Vayu and Grahani. Further research area needed to be explored and more studies are required in this field, which examine the methods in which Pachkagni, Saman Vayu and Grahani, may be insighted with ENS to understand the proper physiology of digestion and metabolism, which may enlighten the much-specialized treatment management. In fact, Ayurveda is really vast and so expanded that it cannot be confined or defined under one single term of research. Here in this research work, an attempt has been made to establish the physiological similarities between these important factors of digestion which are dependent on each other to perform the effective digestion and metabolism with proper understanding at the level of nerve conduction across the lumen of GIT and also further more researches are needed in this area in upcoming years.

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