All Kerala Govt. Ayurveda College Teacher's Association
KERALA JOURNAL OF AYURVEDA
An International Journal of Ayurveda Specialties

ISSN 2583-8555 (ONLINE)
Vol 3(1): 38–43 (2024)
https://doi.org/10.55718/kja.249

REVIEW ARTICLE

AHARA PARINAMAKARA BHAVAS - A KEY TO HEALTH

Nija Chacko[1], Ananda Lakshmy K N[2], Ajitha K[3], Anjali Sivaram[4], Pradeep K[5], Abhilash M[6], Hakkeem Panthappulan[7] & Sumi S[8]

[1] PG Scholar, [2]Professor and HOD, [5]Associate Professor [7, 8] Assistant Professor Department of Kriyasareera, Government Ayurveda College, Kannur
[3]Professor and HOD, Government Ayurveda College, Thiruvananthapuram
[4]Associate Professor [6] Assistant Professor Government Ayurveda College, Tripunithura

*Email: nija16chacko@gmail.com

ARTICLE HISTORY

Received: 24 December 2023
Accepted: 24 February 2024

Available online
Version 1.0 : 31 March 2024

Keywords

Ahara, Ahara parinamakara bhava, digestive physiology, Agni, dosha

Additional information

Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

Reprints & permissions information is available at https://keralajournalofayurveda.org/index.php/kja/open-access-policy

Publisher's Note: All Kerala Govt. Ayurveda College Teacher's Association remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

CITE THIS ARTICLE

Chacko N, Lakshmy A K N, Ajitha K , Sivaram A, Pradeep K, Abhilash M, Panthappulan H, Sumi S. Ahara parinamakara Bhavas - A key to health. Kerala Journal of Ayurveda. 2024; 3(1): 38-43. https://doi.org/10.55718/kja.249

Abstract

Ayurveda is the science of life that gives importance to both prevention and cure of diseases. In Ayurveda, an individual is said to be healthy when there is a state of balance in dosha, dhatu, and mala, along with total well-being of soul, sensory organs, and mind. Ahara plays an important role in maintaining the normalcy of body composition. Ahara is one of the most important factors for the sustenance of life. Ahara, which is one among trayopasthamba provides strength, complexion, immunity and nourishment. Ahara parinamakara bhavas are the factors present in the body that help in the digestion and assimilation of food particles. Complex food substances are transformed into corresponding panchabhoutika constituents which in turn nourish and replenish various dhatus present in the body. The maintenance of an individual's health relies significantly on the proper functioning of vayu, kleda, Sneha, kala, parinama samayoga, and agni. The derangement of ahara parinamakara bhavas is one of the major reasons for the increased prevalence of most lifestyle disorders nowadays. Here an attempt is made to explore the concept of 'ahara parinamakara bhava' within a physiological framework, drawing insights from contemporary science.

Introduction

Ahara- Ahara is the substance consumed, which on completing digestion nourishes the respective gunas of panchamahabhuta in the body [1]

Parinama - Process of digestion & metabolism of the ingested food [2]

Bhava - The inherent factors present in the body. [3]

The digestive process in the human body greatly depends on various factors which are collectively called ahara parinamakara bhava. They are ushma, vayu, kleda, sneha, kala, parinama and samayoga[4]. Ushma[agni] can be considered as prime factor in ahara parinamakara bhava. It denotes various biochemical processes involved in the digestion of food. Samagni representing the normal functional state of agni is one of the important criteria in the definition of swastha[5].

This indicates the importance of agni in maintaining homeostasis of the body. Vayu transports food near the site of agni to facilitate digestion. Various movements of the GI tract are helpful in the proper mixing and digestion of food. Kleda helps in the disintegration of food particles taken

through the oral cavity. Sneha softens the ingredients of food and thereby enhances the function of agni. Kala is the time taken for digestion of food. Samayoga has been defined as the administration of the proper food with consideration of Prakriti (constitution)etc[6]. The exploration of the ahara parinamakara bhava concept holds significant scholarly importance. Applying ahara parinamakara bhava in daily life can offer protective and therapeutic advantages, contributing to the prevention of various lifestyle-related disorders.

Objectives

Understanding factors related to ahara parinamakara bhava in physiological purview.

MATERIALS AND METHODS

Data were collected from all ayurvedic texts including bruhathrayee and laghuthrayee. 56 articles were collected and reviewed. Articles available in search engines were used.

Results and Discussion - Ahara parinamakara bhava

1. Ushma

Just as fire transforms grains into rice, ushma digests ingested food. ushma helps in pachanaprakriya .Agni is the fundamental factor responsible for providing normal complexion, longevity, growth, health, normal luster, and ojus[7].

The individual ceases to exist when the functional state of agni diminishes. If agni functions normally, an individual can lead a prolonged and healthy life. Therefore, agni is considered the fundamental factor contributing to both health and longevity. [8]. Only in the presence of normally functioning agni, food can be properly digested and thereby nourish body tissues.

Pitha and Agni

The type of pitha which can be compared to the action of agni is pachaka pitha. Pitha situated in between pakvasaya and amasaya[pachaka pitha] helps in the digestion of four kinds of food[swallow, chew, drink and lick] and as a result, there occurs separation of sara and kitta. Pachaka pitha functions can be attributed to jataragni due to its agneya nature and also due to its functions like pacana[digestive], pravritti [transformation] and prakashana[illumination].

According to Charaka, agni inside the human body is antharagni. Pachakagni, koshtagni, oudarya agni, kayagni, jataragni, koshtagni are synonyms of pachakagni. 5 types of bhootagni are responsible for converting panchabhoutika aspects of body constituents. 7 types of dhatwagni help in the assimilation of food as well as in tissue building. Jataragni is considered superior to other forms of agni. The strength of jataragni is related to the intensification and reduction of other forms of agni. Individuals should give utmost care to maintain antharagni. The significance of agni is illustrated in various contexts as seen in the definition of swastha by susruta. There is a branch of Ayurveda namely kayachikitsa as its name suggests, it mainly focuses on the treatment or maintenance of antharagni.

A sedentary lifestyle and unhealthy dietary habits, disrupt the natural equilibrium of Agni and, in turn, lead to lifestyle-related disorders.[8] The primary contributors to the rising prevalence of non-communicable diseases are predominantly lifestyle-related factors, including insufficient physical activity, poor dietary choices, and disrupted sleep patterns. Incorrect dietary practices, like Adhyashana (eating before the digestion of previous food) and Vishamashana (eating irregularly in terms of time and quantity), along with improper behavioral patterns such as Vegadharana (suppression of natural urges), can result in the derangement of doshas either individually or collectively, ultimately leading to agnimandya (weakened digestive fire). According to Ayurveda, Agnimandya is considered the fundamental cause of various diseases, including conditions like prameha (metabolic disorders) and sthaulya (obesity). The Ahara Parinamakara Bhavas and the circadian rhythm are predominantly affected by disturbances in one's lifestyle, such as irregular sleep patterns and inadequate dietary choices. These disturbances subsequently result in the development of agnimandya[9] For the preservation of ushma, ahara and vihara play an important role. Adhering to appropriate dietary practices, including dietary restrictions, adopting lifestyle adjustments, and engaging in physical exercise, is essential in preserving the ushma of the body.

Implication of the concept of Agni in modern terms

In addition to digestive enzymes and gut microbiota, ushma represents the overall cellular metabolism inside the body. Various enzymes take part in the digestion of food particles. Catabolism and anabolism of food particles take place with the help of various enzymes. In the mouth, salivary amylase, maltase and lingual lipase help in digestion. In the stomach, pepsin, gastric lipase, gelatin, and nuclease help in digestion. Likewise, amylases, lipases, and proteases help in the digestion of food particles[10].

The microorganisms within the body, known as microflora, serve as Agni sources, reside in the gastrointestinal tract (Mahasrotasa), and play a role in metabolism. The gut microflora, as a whole, displays specific characteristics in the production of substances like SCFAs

(short-chain fatty acids) and various other nutrients, which depend on both the amount and type of medication and dietary regimen [11].

Applied aspects – Deficiency of digestive enzymes leads to a condition called digestive enzyme insufficiency. Exocrine pancreatic insufficiency, lactose intolerance, and isomaltase deficiency all constitute the deficiency of digestive enzymes[12]. Such a condition can be managed through the supplementation of enzymes and by the use of natural enzyme-rich food.

Through supplementation of enzymes

Digestive enzyme supplementation can be seen as a complementary approach in the treatment of various conditions marked by disruptions in digestive function. The treatment of numerous digestive disorders, especially those affecting organs responsible for producing digestive enzymes, like the exocrine pancreas (responsible for pancreatic enzymes) and the small intestinal brush border (responsible for lactase production), currently relies on the utilization of diverse commercially accessible enzyme supplementation formulations[13].

By use of natural enzyme-rich food

a. Pineapple – It comprises digestive enzymes known as bromelain, which function as proteases, breaking down proteins into their constituent components, including amino acids. This aids in the digestion and absorption of proteins.

b. Papaya - The papain enzyme in papaya facilitates the digestion of proteins, making them more easily digestible. In tropical regions, papaya is often regarded as a remedy for constipation and other symptoms associated with irritable bowel syndrome(IBS)[14]

c. Mangoes - Mangoes contain amylases, a group of digestive enzymes that break down carbohydrates from starch into sugars such as glucose and maltose.

d. Honey - Rich in many beneficial compounds, including digestive enzymes[15].

e. Food like ginger, cumin, and turmeric have the potential to stimulate agni. For example, ginger can enhance the digestive process by facilitating stomach movement and increasing the secretion of digestive enzymes.[16]Cumin can improve the process of digestion by increasing the activity of digestive enzymes[17]

2. Vayu

vayu helps in the transport of food near to site of agni to facilitate digestion[18]Chakrapani comments that agni uthejana is the function of vayu. It inspires udarya agni. Prana, samana, vyana, and apana vayu work hand in hand as a single unit for the digestion and assimilation of food particles.

Prana vayu help in anna praveshana karma [deglutition]. Samana vayu helps in recieving, digesting, and separating ama and pakva ahara. The digestive power of jatarani can be attributed to the functional status of samana vayu. Various changes taking place in food material in a cyclic manner help in the digestion and assimilation of food. Vyana vayu helps in the transport of formed rasa dhatu all over the body. It helps in separating sara and kitta. Apana vayu helps in the proper elimination of waste materials after the digestion of food.

Implication of the concept of vayu in modern terms

The activities of the gastrointestinal tract can be categorized within the extensive range of vayu one among the ahara parinamakara bhava. Propelling movements of the muscles of the stomach help the food to be in more contact with gastric juice. Hunger contraction, receptive relaxation, and peristalsis are the movements of the stomach[19] Segmentation contractions and peristalsis related to intestinal movements can be considered as functions of vayu[20]. If any disruptions occur, they will reflect as various disorders.

Motility pathology involving diseases

a. GERD - In GERD, stomach acid contents that enter the oesophagus again irritate the lining and may result in heartburn. The occurrence of GERD[Gastro oesophageal reflux disease] is closely associated with transient relaxation of the lower oesophageal sphincter (LES), bolus transit abnormalities, hypotensive LES, and impaired oesophageal peristalsis.

b. Gastroparesis

Diabetic, idiopathic, and postsurgical gastroparesis are the three subcategories of the chronic condition known as gastroparesis. Gastroparesis is a clinical condition characterized by nausea, vomiting. abdominal pain, bloating and early satiety. The diagnosis is made by evaluating symptoms like delayed stomach emptying, and the clear absence of gastric outlet obstruction.

c. Achalasia

Achalasia is a motility disorder marked by the impaired relaxation of the lower esophageal sphincter (LES) and the absence of esophageal peristalsis. The primary symptoms of this disease include difficulty in swallowing liquids and solids, along with the regurgitation of saliva or undigested food. [21]

3. kleda

Kleda can be defined as the representation of jala Mahabhoota in the body, which is Jala predominant and causes the loosening and softening of solid materials on account of its mridu, snigdha and drava properties. It causes

the disintegration of bolus into droplets. Ashtanga samgraha opines that kledaka kapha [stomach] helps in the disintegration of anna sangatam. Bodhaka kapha helps in perceiving the taste of food. Avalambaka kapha helps in ambukarma which helps in keeping other divisions of kapha in its equilibrium. It also helps in the deglutition of food by forming bolus. Prakrut Kleda is directly linked to jatharagni, mahabhootagni and dhatvagni and contributing to the maintenance of the kayagni within the body. [22]

Implication of term kleda in modern aspect

Kleda can be considered as the water content present in digestive juices. Watery secretion provides a solvent in which the product of digestion is dissolved. This watery vehicle is essential for the absorption of foodstuffs. Enzymes necessitate a specific level of water within their molecular structures to maintain their natural configuration, enabling them to manifest their complete functionality. Furthermore, water, acting as a solvent modifier, can alter solvent characteristics such as polarizability, polarity as well as the solubility of reactants and products up to a certain threshold. Moreover, depending on the nature of the reaction, water can function as either a substrate (e.g., in hydrolysis) or a product (e.g., in esterolysis) of the enzymatic process, exerting diverse effects on enzyme turnover. It has been observed that irrespective of the reaction type, the enzyme functions optimally at a specific level of water content. Beyond this optimal point, enzyme performance deteriorates due to a reduction in enzyme stability[23]

4. Sneha

It softens the ingredients of food and helps enhance the function of agni[5]. As a result, digestive enzymes can act smoothly.

Implication of the term Sneha in modern terms

Gut health relies on the integrity of mucus, and neurological disorders can bring about changes in its properties. Mucus is essentially a hydrated network of polymers, encompassing glycosylated mucin proteins. The elements influencing the nervous system can also impact the volume, consistency and permeability of mucus which, in turn, can affect the composition of gastrointestinal (GI) bacteria populations. The enteric nervous system (ENS), a neural network intrinsic to the entire GI tract that innervates the mucosal epithelium, plays a crucial role in maintaining intestinal well-being. This system oversees various aspects of intestinal function, including the secretion and regeneration of mucus. In individuals with neurodevelopmental disorders such as autism and various neurological conditions like Alzheimer's and parkinson’s disease, dysbiosis and gut dysfunction are often reported. It's important to note that mucus serves as a significant energy source for certain microorganisms. Consequently, any alterations in mucus can exacerbate gut-related symptoms associated with dysbiosis in individuals with neurological disorders[24].

Applied aspects

a. Preclinical studies have demonstrated a correlation between alterations in mucus production and abnormalities in gastrointestinal (GI) anatomy and function. For example, in a mouse model of colitis, the thickness of the intestinal mucus layer gradually diminishes as inflammation progresses. In the absence of inner mucus layer, bacteria can come into direct contact with the colonic epithelium and penetrate deep into epithelial crypts, exacerbating the disease. Furthermore, numerous investigations suggest that modifications in mucus secretory processes lead to an underdeveloped inner mucosa in the colon, often accompanied by a sparse population of goblet cells and an increased susceptibility to colitis.

b. Cystic Fibrosis - As a result of elevated mucus secretion, dehydration of mucus, and increased mucus viscosity, individuals with cystic fibrosis are frequently diagnosed with concurrent GI abnormalities such as meconium ileus and distal intestinal obstruction syndrome. These conditions contribute to the obstruction of the small intestine. Mucus accumulation and reduced mucus movement happen in these patients due to dysregulated mucus secretion[24]

5. Kala

It can be considered as the time factor taken for digestion. This time period is very important as it helps in the digestion and assimilation of food. Retention of food is very much necessary for proper admixture with enzymes and also for adequate movement of the GI tract. Grahani holds and retains the food for proper digestion. It can be considered as a seat of agni. With the assistance of agni, grahani holds undigested food and pushes forward the digested food. Vidagdha ahara murchita dosha or sama dosha affects the proper functioning of agni which in turn vitiates grahani. If grahani is vitiated, food will be released as ama. Food remains in the stomach for a period of about 3-4 hours for proper digestion of food. According to Acharya Charaka, food at the proper time [kala bhojana] helps in proper digestion. Guru ahara requires a longer period for digestion, whereas abhojana and alpashana foods are digested relatively quickly. When these dietary patterns persist consistently, they can lead to agnidushti, by hampering Kala bhava of ahara parinamkara bhavas

Applied aspect – Gastroparesis is a condition in which the stomach takes too much time to empty its contents. After proper digestion, the defecation process washes out

unwanted materials[25]. If a proper time gap is not provided in these conditions it will lead to diseases due to adhyashana. Due to busy schedules, people eat very urgently and they swallow food without proper mastication. Proper mixing with saliva does not happens which results in the entering of hard food into the stomach.

6. Samayoga

Samayoga has been defined as the appropriate administration of the proper food with consideration of Prakriti (constitution)etc[4]. It encompasses the prakruthyadi ashtahara vidhi vishesha ayatana and ahara vidhi Vidhana under samayoga. Samayoga of ashta ahara vishesha ayatana is crucial in reaping the benefits of ahara. The vishesha ayatana gives recommendations that people should adhere to for a healthy existence. It includes meal preparation, food consumption, etc. A person should consume food only after giving importance to ahara vishesha ayatana. It includes prakruthi[inherent property of food], karana [samskaram,], samyoga [combination], rashi [quantity], desha [place], kala[time which includes both season and condition of the patient, upayoga samstha and upayoga niyama. When a person adheres to these rules, ahara parinamakara bhavas can appropriately fulfill their duties. Samayoga is the appropriate combination of all the above ahara parinamakara bhava. if a problem occurs to any of these factors it will lead to improper pachana[26].

Role of manas in maintenance of ahara parinamakara bhava

Ayurvedic texts outline various emotions, known as Manasika bhavas, as the underlying causes of many diseases. These include anger (krodha), desires (kama), jealousy (irsya), grief (shoka), anxiety (chinta), greed (lobha), fear (bhaya), and others. Disruptions in these emotional states can perturb the equilibrium of both the body and the mind, leading to the imbalance of Manasdosha, Sharirik dosha, and Agni, ultimately contributing to health issues. Manasika Bhavas directly lead to indigestion i.e. Agnimandya. Acharya Charaka explains that food consumed in a suitable quantity, aligned with an individual's digestive capacity (agni), may not undergo proper digestion when the person is in a state of bhaya (fear), chinta(anxiety), krodha(anger), Shoka(grief), and dukha-shaiya prajagare(else he sleeps on an uncomfortable bed or staying awake for an extended period[27].

Mental states such as fear (bhaya), anxiety (chinta), and grief (shoka) can provoke the aggravation of vata dosha, primarily affecting prana vayu. Prana vayu, situated within the head where it carries out its functions, shares a direct connection with emotional states like anger (krodha), fear (bhaya), and anxiety (chinta). Prana vayu serves as the regulator of all other physiological forms of Vata, so its aggravation can disrupt vyana and apana Vayu, leading to imbalances. This, in turn, can lead to the vitiation of samana vayu, exacerbated by the influence of Rajas Guna, ultimately resulting in impaired digestion, known as agni dusti.[28] So manasika bhavas have a direct impact on ahara parinamakara bhavas which hampers the digestive process in the human body.

Conclusion

Ayurveda has consistently emphasized the utmost significance of Ahara and Agni. Ahara plays an important role in maintaining the health of an individual. The process of digestion of food is carried out by ahara parinamakara bhava. The ancient sages elaborated on the concepts of Ahara Parinamakara Bhavas as essential guidelines for achieving and maintaining good health. It includes ushma, vayu, kleda, Sneha, kala, parinama and samayoga . These factors have a significant role in the digestive process. Food that is consumed undergoes a process of transformation within the body, ultimately affecting its various tissues and entities. When food possesses qualities that support and nurture these bodily entities, it has the capacity to nourish and rejuvenate them. It enables the proper transformation of Ahara into Dhatus, ultimately contributing to the maintenance of a balanced state in terms of Dosha, Dhatu, and Mala. If the food possesses qualities that are in opposition to the well-being of these bodily entities, it can lead to their undernourishment or, in some cases, even their destruction. Conversely, when these functions are disrupted, it can result in impaired digestion. Vitiated agni results in ama formation. These are the root causes of many diseases like prameha, sthoulya, etc. So proper functioning of Vayu, Kleda, Sneha, kala, Parinama Samayoga along with Agni plays a pivotal role in the maintenance of the health of an individual.

References

1. Jadavji trikamji. Susruta Samhitha with nibandha samgraha commentary of Dalhana. Reprint edition. Sutra sthana. Annapana vidhi adhyaayam. 46/526.Chowkambha Sanskrit series, Varanasi; 2021. 253p.
2. Prof. K.R.Srikantamurthy. Vagbatas Ashtanga Hrudayam. 9 th Edition. Volume I. Sutra sthanam. *Dravyadi vinjaneeyam* adhyayam. 9/20. Chowkhamba Krishnadas Academy, Varanasi; 2013; 140 p
3. Vaidya Jadavji trikamji acharya. Agnivesa,Charaka samhitha with Chakrapanidutta Ayurveda Dipika commentary. Reprint edition. Indriya sthanam . indriyanikam indriya 4/27. Chawkhamba Orientalia, Varanasi; 2021. 360p.
4. Vaidya Jadavji trikamji acharya. Agnivesa,Charaka samhitha with Chakrapanidutta Ayurveda Dipika commentary. Reprint edition.

Sareera sthanam. shareera vichayam shareera 6/14. Chawkhamba Orientalia, Varanasi; 2021. 332p.

5. .Jadavji Trikamji. Sushruta Samhita of Susruta with Nibandhasangraha Commentary of Dalhanacharya. Reprint edition. *Sutra sthana.*15/41 Chawkhamba Sanskrit Sansthan, Varanasi, 2021; 75p]
6. Vaidya Jadavji trikamji acharya. Agnivesa,Charaka samhitha with Chakrapanidutta Ayurveda Dipika commentary. Reprint edition. Sareera sthanam. shareera vichayam shareera 6/15. Chawkhamba Orientalia, Varanasi; 2021. 332p.
7. Vaidya Jadavji trikamji acharya. Agnivesa,Charaka samhitha with Chakrapanidutta Ayurveda Dipika commentary. Reprint edition. chikitsa sthanam. 15/7. Chawkhamba Orientalia, Varanasi; 2021. 512p.
8. Poojary AS, Banu W. „Role of Agni in Lifestle Disorders ". International Ayurvedic Medical Journal. 2018;6(4):841-5.
9. Deshmukh S, Vyas MK, Dwivedi RR, Vyas HA. A randomized open -label comparative clinical study of effect of lifestyle modification and Shatapushpadya Churna on Agnimandya. Ayu. 2016 Jan;37 (1):45.
10. K.Sembulingam. Essentials of medical physiology. 6 th edition. Jaypee Brothers medical publishers. 1999. GI system. Chapter 38. 233p
11. Ranade AV, Shirolkar A, Pawar SD. Gut microbiota: One of the new frontiers for elucidating fundamentals of Vipaka in Ayurveda. Ayu. 2019 Apr;40(2):75
12. https://www.hopkinsmedicine.org/health/wellness-and-prevention/digestive-enzymes-and-digestive-enzyme-supplements#:~:text=A%20few%20types%20of%20digestive,digest%20carbohydrates%2C%20proteins%20and%20fats. Accessed on 8 september 2023
13. Ianiro G, Pecere S, Giorgio V, Gasbarrini A, Cammarota G. Digestive enzyme supplementation in gastrointestinal diseases. Current drug metabolism. 2016 Feb 1;17(2):187-93.
14. Muss C, Mosgoeller W, Endler T. Papaya preparation (Caricol) in digestive disorders. Neuro Endocrinol Lett. 2013;34(1):38-46. PMID: 23524622.
15. https://www.healthline.com/nutrition/natural-digestive-enzymes . Accessed 8 september 2023
16. Chumpitazi, B.P., Kearns, G.l., & Shulman, R.J. (2018) Reviewarticle: the physiological effects and safety of peppermint oil and its efficacy in irritable bowel syndrome and other functional disorders. Alimentary pharmacology & therapeutics, 47(6), 738-752.
17. Milan KM, Dholakia H, Tiku PK, Vishveshwaraiah P. Enhancement of digestive enzymatic activity by cumin (Cuminum cyminum L.) and role of spent cumin as a bionutrient. Food chemistry. 2008 Oct 1;110(3):678-83.
18. Vaidya Jadavji trikamji acharya. Agnivesa,Charaka samhitha with Chakrapanidutta Ayurveda Dipika commentary. Reprint edition. Sareera sthanam. shareera vichayam shareera 6/15. Chawkhamba Orientalia, Varanasi; 2021. 332p.
19. K.Sembulingam. Essentials of medical physiology. 6 th edition. Jaypee Brothers medical publishers. 1999. GI system. Chapter 38. 273p
20. K.Sembulingam. Essentials of medical physiology. 6 th edition. Jaypee Brothers medical publishers. 1999. GI system. Chapter 38. 277p
21. Patel KS, Thavamani A. Physiology, peristalsis. InStatPearls [Internet] 2023 Mar 12. StatPearls Publishing.
22. Hardik P. Jyani, Hrishita Dahilekar, Sandeep G. Dahilekar, Gaur. A review concept of kleda in ayurveda literature. Journal of Emerging Technologies and Innovative Research (JETIR). 2021 JETIR June 2021, Volume 8, Issue 6. ISSN-2349-5162.
23. Rezaei K, Jenab E, Temelli F. Effects of water on enzyme performance with an emphasis on the reactions in supercritical fluids. Critical reviews in biotechnology. 2007 Jan 1;27(4):183-95.
24. Herath M, Hosie S, Bornstein JC, Franks AE, Hill-Yardin EL. The role of the gastrointestinal mucus system in intestinal homeostasis: implications for neurological disorders. Frontiers in cellular and infection microbiology. 2020 May 28;10:248.
25. Camilleri M, Chedid V, Ford AC, Haruma K, Horowitz M, Jones KL, Low PA, Park SY, Parkman HP, Stanghellini V. Gastroparesis. Nature reviews Disease primers. 2018 Nov 1;4(1):41.
26. Dr. T. sreekumar. A textbook of ayurvedic physiology. Harisree publications. Ist ed.Thrissur. 2022. Chapter 10. 158p.
27. Lande VS, Mishra VS. Effect of manas bhava on agni–a review.
28. Vinuta Patil, Venkatesha S, Subhash Chandra Bose. Critical evaluation on the role of manasikabhava in the etiopathogenesis of grahani - an observation study. World Journal of Advance Healthcare Research. 2020;4(6):92-99. ISSN: 2457-0400.

§§§