Review Article

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A CRITICAL REVIEW OF PACHAKA PITTA IN MODERN PHYSIOLOGICAL PERSPECTIVE

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ABSTRACT

Science of *Ayurveda* is based on *tridosha* theory. *Pitta*, one among three *doshas* plays a major role in digestion and metabolism. *Pitta dosha* is of five types namely *pachaka, ranjaka, alochaka, bhrajaka, and sadhaka pitta*. *Pachaka pitta* is responsible for digestion of food, *Vibhajan* of *Sara* and *Kitta* and it nourishes the *Agneya* part of *Pitta* located in different parts of body. It is also termed as *jatharagni*. This *agni* form *Pitta* helps in digestion of food, and afterwards separates the *Sara* and *Kitta bhaga*. Being in its location it nourishes and provide strength to rest *Pitta*. *Pachaka Pitta* is responsible for *Aahar Pachan* and this is well proved in our text. On the other hand, modern or the contemporary science after so many studies proves this that various digestive juices are responsible for digestion of food. As the functions of *pachaka pitta* suggest, all enzymes responsible for digestion like amylolytic, proteolytic and lipolytic enzymes, may be compared with *pachaka pitta*. Few works have been mentioned on conceptual features of *pitta*. In this article correlation of the physiological activity of *pachaka pitta* with modern medical science has been stated. For this study, the basic materials have been collected from the *Ayurvedic* classics with the available commentaries, as well as Text books of modern medical science better understanding of the concept and its comparison with contemporary science.

KEYWORDS: *Digestive enzyme, Jatharagni, Pachaka pitta, Pitta*

INTRODUCTION

In *Ayurveda* a healthy person is he whose humours and metabolic state are in equilibrium, whose functional activities of the tissues and excretory products (i.e. physical state) are in balance amnd the soul, senses and mind (i.e. mental state of the body) fell well[1]. Concept of *tridosha* is basically a theory and any single substance or structure cannot represent a *dosha*[2]. Among three *doshas pitta* is responsible for digestion, metabolism, production of heat and other forms of energy. That's why is termed as *agni* by different *acharyas*. *Pitta dosha* has been divided into five types on the basis of location namely *paachak, ranjak, saadhak, alochaka, bhrajaka pitta*. All these five type of *pitta doshas* have their different location and function as well. Among the five types of *pitta, paachak pitta* has an important function in digestion and metabolism. It has also other functions which act at different level. It performs its function with the help of *samana vayu, prana vayu* and *kledak kapha*. These entities cooperate and coordinate with each other while performing these types of physiological functions. So there is a need of proper understanding the functions of *pachaka pitta* according to modern prospective.

Pachaka pitta cannot be represented by a single entity at all the time as there is variation in the functions. Again *Ayurveda* is the science based on the concept of functional understanding. In these modern era students particularly first year of Bachelor of *Ayurvedic* Medicine and Surgery face a lot of problem in understanding the concept of Ayurveda. There is no specific correlation of *Pachaka pitta* mentioned in *Ayurvedic* literature in terms of supporting modern literature. Increased demand of *Ayurveda* science is required to understand the depth of *Ayurvedic* principles on criterion of modern medical science in an easy mode. In this review we are trying to identify anatomical structures based on its physiological functions retrospectively described under the function of *pachaka pitta*.

SITE AND FUNCTION OF *PACHAKA PITTA* BY DIFFERENT *ACHARYA*

	Sushruta Samhita[3]	*Astanga Hridaya*[4]	*Astanga Samgraha*[5]
Sthan (Location)	Resides in between the *amashaya* and *pakvashaya*	Located in the interior of *pakvashaya* and *aamashaya*	Located in between pakvashaya and aamashaya
Karma (Function)	Digests the food, separate the essence and wastes from it; it supports the other pitas located in different places.	Cooks the food, divides it into essence and waste separately, it bestows grace (help) to other *pitta* present there also the others by giving them strength.	Digestion, separation of *doshas, rasa, mutra*, and *purisha*, it helps the other sites of *pitta dosha* elsewhere in the body by bestowing properties of fire.

Acharya Dalhana in *Nibandha Sangraha*, described about *Pachaka Pitta* and mentioned that it resides in *Nabhi* between *Amashaya and Pakvashaya* and responsible for separation of *Dosha, Rasa, Mutra,* and *Purisha*[6]. *Acharya Sharangadhara* mentioned *Agnashaya* as the site of *Pachaka Pitta* where it is present in form of *Agni Rasa Rupa* and also it has *Lakshana* like *Agni.* It is secreted in *tila pramana* quantity and termed it as *Tilonmitta* which means it can be secreted or it can penetrate very minute channels[7]. A.S. and A.H. describes about *pachaka pitta*. It is *Panchabhutamaka* but *tejo* dominant, devoid of liquidity performs the function of digestion and metabolism with the help of *vayu* and *kleda*[8]. *Acharaya sushrut* narrated *pachaka pitta* as *pachakagni*. *Pachakagni* residing in its own place nourishes various *Agni* or provides *Ushma* to various *Dhatwagni.* For nourishment of this *Agni* also *Pachakagni* is responsible. It can be stated that if *Pachaka Pitta* is strong then it provides strength to rest *Pitta* and *Agni* and when it is weak it leads to weak *Agni* and functions of rest *Pitta*. Therefore, *Pachaka Pitta* is basis for all and hence given outmost importance among various types of *Pitta.*

MODERN ASPECTS

AHARA PACHANA AND AHARA RASA FORMATION

Agni is responsible for *aahara pachana*. There are 13 types of *agni* described in ancient literature. These are *jatharagni, bhutagni* and *dhatavagni*. After the intake of *panchabhoutika ahara agni* act upon it and leads to formation and nourishment of *dhaatus*. The ingested food is carried to *koshtha* by *prana vata*[9]. The food disintegrates because of the liquids, and further it becomes soft because of the mucous substances. This action is performed by *kledaka kapha*. The *samana vata*, intensifies the *pachakagni (*digestive enzymes) and properly digests the food[10]. Here the *agni* is meant for *jatharagni or pachakagni or pachaka pitta*. Seat of *Pachaka Pitta* is the site between *Pakwashaya* and *Amashaya*. In this region various *srotas* secrete various *pachaka srava*. *Grahani Pradesh* where *Anna Pachana* occurs also called as *Pittadhara Kala* is stated as the main *Sthana* of *Pachaka Pitta.*

Digestion is a process which is responsible to breakdown complex part of food particles into simpler form. The process of digestion begins from the mouth itself but as food stays for shorter duration so complete digestion do not occur. Similarly in stomach complete digestion do not occur. Digestion continues up to small intestine. Maximum absorption of digested food products takes place in small intestine. In *Ayurveda Grahani* may be compared with duodenum where most of the digestion occurs. Various digestive enzyme and hormones help in the digestion of protein, carbohydrate and fat.

Various digestive enzymes and their action[11]

Digestive enzyme	Action
Trypsin, Chymotrypsin	Breaks down protein into peptides
Carboxypolypeptidase	Splits some peptides into individual amino acids
Pancreatic amylase	Hydrolyzes starches, glycogen, and other carbohydrates to disaccharides and a few trisaccharides
Pancreatic lipase	Hydrolyses neutral fat into fatty acids and monoglycerides
Cholesterol esterase	Hydrolysis of cholesterol esters
Phospholipase	Splits fatty acids from phospholipids
Salivary amylase	Convert starch into maltose
Maltase	Covert maltose into glucose
Lingual lipase	Converts triglyceride of milk fat into fatty acids and diacylglycerol
Pepsin	Convert protein to proteoses, peptone and polypeptide
Gastric lipase	Converts triglyceride of butter to fatty acids and glycerol
Gastric amylase	Convert starch to dextrin and maltose
Gelatinase	Concert gelatin and collagen of meat to peptide
Urase	Convert Urea to ammonia

VIBHAJANA OF SARA AND KITTA

It means separation of essence and waste products of digested food which is performed after the digestion of food. *Samana vayu* initiate the *pachaka pitta* (digestive enzyme) for hydrolysis. After that nutrient and waste products are divided. Nutrient products are absorbed by the help of *samana vayu* and waste products are eliminated by *apana vayu*[12].

NOURISHES VARIOUS PITTA STHANA

Pachaka pitta which is termed as *jatharagni* located, at its own place (between the *Amashaya* and *Pakwashaya*) and by virtue of its inherent power, it augments the actions of the other sites of *pitta* present elsewhere in the performance of metabolic functions of the body. *Pachaka pitta* may be compared with digestive enzymes that help in digestion of food material.

- *Ranjaka pitta* which resides in *yakrit* and *pliha* help in coloration of *rasa dhatu* means the formation of *rakta dhatu*. Factors regulating erythropoiesis and maturation of RBCs are vitamin B_{12}, folic acid, pyridoxine, Vitamin C (helps iron absorption), minerals like iron, copper which mainly comes from diet[13]. If the digestion of food is not occurred properly vitamin B_{12}, iron, folic acid and others cannot absorb properly.
- *Sadhaka pitta* which resides in *hridaya* helps in fulfilling the desires of mind. If there is improper digestion, *ajirna* will occur. During *ajirna bhrama, murchha* like symptoms are appeared so that function of *sadhak pitta* is hampered.
- *Alochaka pitta* which resides in *dristhi* (eye) helps in perception of vision. Vitamin A is present in both cytoplasm of the rods and in the pigment layer of retina. Vitamin A is responsible for formation of Rhodospin. A chemical route by which all-trans retinal can be converted in to 11 cis-retinal. First all trans retinal is converted into all trans-retinol. All trans-retinol is one form of vitamin A. Then all trans-retinol is converted into 11-cis retinol under the presence of isomerase enzyme. Finally the 11 cis-retinol is converted into 11-cis retinal. 11-cis retinal is combined with scotopsin to form rhodopsin. β carotene is present in plants (particularly carrots). In the intestine β carotene splits into two molecule of retinol (vitamin A). Retinal is the aldehyde derived from alcohol. In the rods of retina a pigment rhodospin is present which are required for seeing in dark/dim light. If β carotene containing food products are not properly digested retinol cannot formed so that there is difficulty in formation of rhodospin and perception of vision in dim light disappears[14].
- *Bhrajaka pitta* which resides in *twak* helps in digestion and absorption of substance that is being used in *mardan, sechana, avagahana* and expression of shades in the skin. Mainly *pachaka pitta* is responsible for all chemical reaction. It helps *bhrajaka pitta* for this type of function. *Dhatavagni* depend upon *pachakagni*. Aggravation and diminution of *pachakagni* results in the aggravation and diminution of other *agni*. *Pachaka pitta* helps in the formation of nutrient products which is used for the nourishment of every cell. After the proper growth of the cell *bhrajak pitta* perform its function. The substance which is lipid in nature enters the cell membrane of the cell.

ABSORPTION OF *AAHAR RASA*

After the intake of *aahara*, it moves towards the *kostha* by the help of *prana vayu*. The site of *pachakagni* is *grahani* or *pakvamashaya* better known as *pittadhara kala*. *Samana vayu* which is present in *amashaya* stimulate the *pachakagni* for the digestion and separation of food as well as *shoshyati* i.e., absorption of water and nutrients[15]. This absorption of nutrient and water requires movement which is the main function of *vata*. So here both *samana vata* and *pachakagi* is responsible for absorption.

Absorption from small intestine each day consists of several hundred grams of carbohydrate, 100 or more gram of fats, 50-100

gram of amino acids, 50-100 gram of ions, and 7-8 lit of water. In small intestine sodium absorption is powered by active transport of sodium from inside the epithelial cells. This active transport requires energy. Part of sodium ion is absorbed along with chloride ion. The negatively charged chloride ions are passively dragged by the positive electric charge of sodium ions. Sodium is also co transported by specific carrier proteins including sodium glucose co-transporter, sodium amino acid co-transporter and sodium-hydrogen exchanger. The next step is the osmosis of water. This osmosis occurs because a large osmotic gradient has been created by the elevation of concentration of ions[16]. This process in small intestine need energy which is nearly similar to *khalekapota nyaya* in which the pigeons have to spend energy to procure the grain and this process is active one[17].

Two types of *paka* occur in process of digestion namely *avastha paka* and *nistha paka*. *Avastha paka* is of three types i.e., *madhura avastha paka, amla avastha paka, katu avastha paka*. In the process of *katu avastha paka* (*soshyamanena vanhina*) *jatharagni* helps in absorption of water[18]. Most of the water present in the chyme is absorbed in the colon. This process may be similar to *kedarikulya nyaya*[19]. It does not require energy. This theory explains the importance of pressure-gradient which determines the flow of fluid into the tissue spaces. This theory can explain the passive diffusion where different field receive water through different channel without expenditure of energy.

DISCUSSION

Basically *Vata, Pitta, Kapha* constitute three regulatory systems i.e. nervous, endocrine and immune system respectively of all living system. Among five types of *pitta, pachaka pitta* is termed as *jatharagni* by all the *Acharyas*. *Pachaka pitta* is located in *grahani* and responsible for *pachan, sara kitta vibhajana, anugrahana* of other *pitta.* Mainly *pachaka pitta* is responsible for digestion. Mostly three factors are responsible for digestion. *Kledaka kapha, pachaka pitta* and *samana vayu*. *Samana vayu* stimulates *pachaka pitta* for digestion of food as well as separation of nutrient and waste product. *Kledaka kapha* helps in disintegration as well as softness of food. After the digestion of food *Pachakagni* and *samana vayu* by *munchana* action helps in propelling chyme in their respective way i.e., waste materials towards large intestine and *saara bhaag* is propelled towards intestinal villi. By the *soshyati* action of *agni, saara bhaag* is absorbed through intestinal villi and reached to superior mesenteric vein. From superior mesenteric vein with the help of *samana vayu* it reaches to heart through portal vein and inferior vena cave via liver. From the above details the functions of *Pachaka pitta*, described by *acharyas* can be compared with the physiological functions of Trypsin, Chymotrypsin, Carboxypolypeptidase, Pancreatic amylase, Pancreatic lipase, Cholesterol esterase, Phospholipase, Maltase, Pepsin, Gelatinase, Urase. *Pitta dosha* stands for all type of chemical reaction in our body in which there is production of heat and other forms of energy. *Pachaka pitta* has a great role in digestion which helps to catalyze the other chemical reaction or function of other *pitta*.

CONCLUSION

There are five type of *pitta* namely *pachaka, ranjaka, sadhaka, alochaka, bhrajaka.* The main site of *pachaka pitta* is between *pakwashaya* and *amashaya*. The main function of *pachaka pitta* is digestion of food, separation of nutrient and waste material, and it nourishes the other *pitta* located in different parts of the body. It is *panchabhoutika* in nature but due to dominance of *agneya bhaga* it performs function like *pachana* and *dahana.* Therefore it is termed as *agni*. As *Ayurveda* is based on functional understanding *pachaka pitta* may be correlated with digestive enzymes. There is a need of further research to evaluate in detail of all other *pitta dosha* for the betterment of mankind.

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