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Abstract
The concept of the panchmahabhoota (five gross elements) is a widely acclaimed theory of Indian Philosophy and Ayurveda, the traditional Indian science of medicine. This theory is the base of the Ayurveda model of health. The cause of disease is also attributed to the imbalance of these elements as they form the basic entities of the dosha, dhatu and mala. The shalakya tantra in Ayurveda deals with the diseases of the supraclavicular region of the body. The panchmahabhoota play a significant role in understanding the physiology, pathology and planning of the treatment in the diseases of this region. This paper decodes the panchmahabhoota with a special emphasis on the applied aspect of the same in the diseases studied under the shalakya tantra.

Keywords: Panchmahabhoota, Ayurveda, Physiology, Pathology, treatment.

1. Introduction
The Indian philosophy or the Darshan shastra is the source of the origin of a number of basic principles of Ayurveda. Amongst these concepts, the very important concept of Panchmahabhoota (the five basic gross elements) is accepted by all the seers of yore. This is therefore the Sarvatantantra Siddhanta [1]. These five elements form the base of each and every substance in this world but unfortunately they have not been utilized to their potential especially in the different treatment procedures in Ayurveda. The famous Ayurveda surgeon, Sushruta has quoted that if anybody knows Panchmahabhoota well, he shall have nothing to worry about the treatment [2]. Relation of Panchmahabhoota with the Ayurvedic basics of Rasa, Dosha et al., is conspicuous by its presence in the classics of Ayurveda. Therefore, the Panchmahabhoota are the base of thinking of all the eight branches of Ayurveda, [3] including the Shalakya Tantra [4]. The role of Panchmahabhoota in Shalakya Tantra has not mentioned directly in the classical texts of Ayurveda except Panchmahabhoota in context of the anatomy of the Eye [5]. Hence here a small effort has been made to understand and review the etiopathology of diseases of Shalakya Tantra in context of the basic elements, Panchmahabhoota. The Vaisheshika school of Kanada has proposed the six categories under which the dravya includes the Panchmahabhoota [6].

2. The Panchmahabhoota- All Pervading Elements
All living or non living substances of universe is made by five basic elements i.e. Panchmahabhoota [7]. The all pervading nature of the Panchmahabhoota can be gauged by the presence of the same in the smallest particle known as atom. If atom is panchabhautika then it per se validates the universal presence of the Panchmahabhoota. These Panchmahabhoota can be identified in the universal entities through their characteristic properties and manifestations. The whole world is in fact the transformation of the Panchmahabhoota. Each of the five mahabhoota has its own specific subjects known as Artha - Vishaya i.e. Akasha- Shabda, Vayu – Sparsha, Agni - Roopa, Jala – Rasa and Prithvi- Gandha [8]. This can be best understood through the application of the anvay – vyatirek vyapti. This implies that wherever Shabda (sound) is present, Akasha is present and vice-versa. Similarly other four mahabhoota can be understood. The specific characteristic of each Mahabhoota [8] is the sign of manifestation suggesting its presence. Specific character of Vayu is Chala (movement), Agni – Ushna (hotness), Jala - Drava (fluidity), and Prithvi – Khara (roughness) and can be easily understood but Apratighat (Non resistance) of Akasha...
needs to be clarified. *Apratigath* means unobstructed. For example, if one can moves his hand in Air it shows *Apratigath* which is further indication of presence of *Akasha*. Though *Vayu* is also there but if *Vayu* is increased, it becomes difficult to move the hand. i.e. moving of hand out of fast moving train. Hence *Apratigath* is the specific sign of *Akasha* and cannot be linked with any other mahabhoota.

A substance is utilized due to its function and functions of *Panchmahabhoota* have not been mentioned directly but the function of substance dominant in particular Mahabhoota has been proposed by the revered seer Charaka. It has been quoted that the *dravya* which has dominancy of *Akasha* produces the *Mardav* (Softness), *Saushirya* (Porosity), *Laghava* (Lightness) in the body. *Vayu* mahabhoota dominant *dravya* produces the *Raukshya* (dryness), *Ghani* (Exhaustion), *Vichara vaishdhyaa* (Calmness). Similarly *daha* (Burning sensation), *Paka* (Digestion), *Prabhha* (lustre), *Prakash* (brightness) and *Varna* (Complexion) is the function of *Agni* mahabhoota dominant *dravya*. *Dravya* which has *Jala* mahabhoota dominence does *Upakleda* (moisture), *Sneha* (lubrication), *Bandha* (Binding), *Vishyandana* (Flowing), *Mardava* (softness), *Prahld* (Pleasure). *Parthiv Dravya*, on the other hand produce *Upachaya* (Growth), *Sanghat* (Formation of compounds), and *Gaurav* (heaviness), *Shirivatva* (stability) in the body. After knowing the specific quality, characteristic and actions, it is validated that presence of *Panchmahabhoota* in all substances of universe is essential. In Atom Electrons are moving in its axis due to *Apratigath* (non-obstruction) of *Akasha*, Moving itself indicates *Vayu* (Chala), Anions and Cations having positive and negative charges which shows *Agni* Mahabhoota, they bind together due to *Jala* Mahabhoota, weight of that particular atom shows *Prithvi* in Atom. Similarly in a cell also, the Cell wall represents *Akasha* (porous) and *Vayu* (exchange of ions), while mitochondria is known as Power house of cell which is correlated to the *Agni* Mahabhoota, cytoplasm has dominence of *Jala* and the nucleus can be understood to be dominant in *Prithvi* Mahabhoota.

Evolution of *Panchmahabhoota* described by *Chararya Charaka* is in chronological order which is *Akasha- Vayu- Agni- Jala- Prithvi*.[10] The dissolution of *Panchmahabhoota* has been described in *Nirvana Tantra* which is reverse than evolution i.e. *Prithvi- Jala- Agni-Vayu- Akasha*.

3. The Application of the *Panchmahabhoota* in Shalakya tantra -

The concept of *Panchmahabhoota* can be studied in its applied aspect in relation to the *Shalakya Tantra* with reference to the functioning of senses during sleep. In the definition of sleep, *Charaka Acharya* has mentioned that all the senses in the state of sleep do not have any contact with their respective subjects.[11] Waking stage can be correlated with the evolution theory where the ear contacts with its subject which is the sound (Shabda) and related with *Akasha mahabhoota*.

Whenever a person is awake he always experiences some sound. Second sense which gets activated is the *Sparshendriya* or the skin. Dissolution theory of *Panchmahabhoota* can also be correlated with the sleeping condition. In the state of the *Tandra* (pre-sleeping condition), the ear is the last sense organ which gets switched off. In this condition of *Tandra* one can perceive the Sound, but cannot perceive the words spoken. In both the conditions, *Prithvi* is the last in evolution and first in dissolution which is well understood in the concept of sleep in modern science which states that *Olfaction* is totally absent in the state of sleep. So a person cannot perceive any kind of smell during sleep hence fire alarm has been put at the fire zone.

*Shalakya Tantra* basically deals with sense organs known the *Jnanendriya* in Sanskrit parlance. While describing the relation between *Jnanendriya* and the *Panchmahabhoota*, *Charaka Acharya* opines that all the five senses are made up of *Panchmahabhoota* but the dominance of one *Mahabhoota* should be accepted in each sense organ like the ear (*Shrotrendriya*) is dominant in *Akasha* et al. This can be further useful in understanding the manifestation of disease and its treatment. In the ear, *Akasha* is dominant in comparison to other senses and the other four *Mahabhoota* are the supporting factors. Movement of tympanic membrane in ear shows *Apratigath* of *Akasha*. Without *Akasha* membrane cannot vibrate. Similarly in Eye, rods and Cones have the dominance of *Agni*, Salivation around tongue shows dominance of *Jala Mahabhoota* while anatomy of nose especially the cartilages indicate the *Prithvi Mahabhoota* dominance.

In concept of *Indriya Panchpanchaka* (five points related to the five senses)[12], mentioned in the classics can be applied in understanding of the diseases and the treatment of the sense organs. The *Panchpanchaka* comprises of the five senses or *Panchendriya* which perceive the object, the substratum of the senses known as *Panchendriya dravya* namely the *Akasha*, *Jala*, *Agni*, *Jala*, and *Prithvi* by which treatment is carried out as the of the *panchmahabhoota* is compulsory in all the substances, the *panchendriya adhirshthana* i.e. the site of the senses namely the two ears, two eyes, one nose, one tongue and all pervading skin. These sites are the examination points for the physician like the otoscopy and rhinoscopy. They are the site of manifestation of the disease. In the *Indriya Panchpanchaka*, next is the *Panchendriya Artha* i.e. the objects of the senses comprising of the *shabda*, *sparsha*, *roopa*, *rasa* and *gandha*. Followed by the *Panchendriya Artha* is the all important concept of the *Panchendriya Buddhi* i.e. the knowledge produced or the cognition. The causative factors of the disease includes the insufficient/deficient contact of the object with the sense known as *heena yoga*, the improper or non-judicial contact known as the *mithya yoga* and the excessive contact known as *ati yog*.[13]

*Panchmahabhoota* play an important role in the physiology of the body and the sense organs which is visible in the form of pathological manifestations. The site of the sense organs is the point of manifestation of the signs and symptoms of the disease. *Shrotrendriya* and its site of ear have dominance of *Akasha* as mentioned earlier. Hence it can be said that the Impairment in its function will also be attributed to the same *Akasha*. Decreased or increased *Akasha* will be main reason for all types of *Karma Roga* (ear diseases). Increased *Akasha* suggests the perforation leading to the increased porosity or *saushirya* like the perforated Tympanic membrane that loses its ability to vibrate just as the perforated drum. Causative factor for the *Akasha Vridhidi* is mainly the agni having the ushna-tikshna guna and the dry (ruksha) *Vayu*. This pathology is rectified with the intake of *ghee* (ghritpana), *rasayana*, *ayuyam*, *brahmacharya* and *abhashanam*.[14] This treatment mainly deals with correction of the *Vayu* and *Agni Mahabhoota*. In an opposite case, if *Akasha* decreases it means the diminution in *Apratigath* like the bulging of tympanic membrane which again involves the malfunction of the vibration of tympanic membrane. Causes for the *Akasha Kshaya* i.e. the diminution of the *Akasha* will be the either
prithvi comprising of the stable (sthira) and heavy (guru) attributes like the ear wax or Jala comprising of the fluid (drava) and unctuous (snigdha) attributes seen in the cases of secretions from the ear (karna or swara) [19]. The treatment module comprises of the use of the drugs or methods dominant in Agni, Vayu and Akasha mahabhoota like the ashir snanam (bathing other than the head) and the use of the drugs having the dominance of the katu (pungent) and tikta (bitter) tastes. The sparshendriya is used in broad aspect. Not only the skin which is seen through the eye, the sparshendriya can be understood as the Receptors. The various types of receptors are-

- Mechanoreceptors work mechanically like vibration i.e. in ear - tympanic membrane vibration.
- Chemoreceptors work in response to the chemical reactions like the mucosal membrane of the nose that responds to the irritant, and the response to the hot and cold in the mouth. Smell perception of an irritant does not take place when it comes in contact with the mucosal membrane of nose. It directly causes the sneeze. Similarly in the mouth also the perception of the taste does not take place when hot/cold things are ingested.
- Photoreceptors in eye i.e. Rods and Cones. Any kind of foreign body in the eye leads to the lacrimation.

Here it should be noted that Vibration, Irritation, Hot, Cold are the subject of sparshendriya. Hence these receptors can be correlated to sparshendriya which has relation with Vayu Mahabhoota [16].

Even all impulse to the brain and motor from the brain is due to movement due to the Vayu. So, Vayu plays a major role along with all sense organs to perceive the objects.

Acharya Sushrut has mentioned dominance of each mahabhoota in different layers of the eye but due to preponderance of Agni mahabhoota in Chakshurendriya, it is mainly the causative factor for the diseases of eye.

4. Study of some diseases of Shalakya in terms of Panchmahabhoota-

The disease Shuska akshi paka, [17] is the best example of Agni vridhdi along with Vayu vridhdi in the chakshu. Opposite of that the concept of Agni kshaya can be seen in the disease of eye namely the Adhimantha, [18] correlated with the Glaucoma in modern science wherein the intra-ocular pressure increases with the impairment of vision. The reason for the Agni diminution is other three Mahabhootas i.e. Jala (fluid), Prithvi (gross) and the Vayu (cold). Here one thing should be noticed that either in Agni vridhdi or kshaya, the Vayu plays a major role. Anal (agni) and Anil (vayu) are friends as the increased or decreased vayu leads to impairment of agni. Balance of Agni can be maintained by maintaining Vayu. Treatment of Agni vridhdi in chakshu should be done with Netra Tarpana (nourishment to the eyes), Dugdha/Jala Parishek (pouring of the milk and water), Aschyotan (eye drops) while the Agni kshaya can be treated by the application of the Tikshnanjana (pungent collyrium).

The presence of Panchmahabhoota in different layers of the eye leads the understanding of the vridhdi and kshaya of other two mahabhootas namely the Akasha and Prthivi. Akasha vridhdi can be understood as short sightedness or myopia whereas the Akasha kshaya as hypermetropia or long sightedness. The vridhdi of Prithvi mahabhoota can be taken as Cataract/pterygium. The treatment of above mentioned diseases will be opposite to attribute of that particular Mahabhoota as Tarpana in myopia.

In chronological order of evolution of Panchmahabhoota, the Jala evolves after the agni [23]. This is significant as it deals with the Rasanendriya and its Adhisthana, Jihva or the tongue. Almost all kind of diseases of tongue can be classified into two i.e. the Jala Mahabhoota Vridhdi or the Jala Mahabhoota Kshaya as the origin of rasanendriya is Jala Mahabhoota. Properties of all mahabhoota are the main responsible factor for the manifestation of the diseases in the senses.

Either increased or decreased Jala Mahabhoota leads to jihva roga. Increased drava guna (fluidity) of Jala mahabhoota leads to excessive salivation in the mouth. Opposite to that if Vayu (ruksa), Agni (ushna), prithvi (kshara) is increased, the Jala is depleted in its dravaguna leading to the dryness of the mouth and due to dryness, the taste cannot be perceived. The pores of the tongue where salivation occurs are obstructed either by Agni, Vayu or Prithvi. Hence salivation decreases. As per Ayurveda as well as the modern science, the taste of particular item is felt because it dissolves into the saliva.

Last mahabhoota to evolve in the chronological order is Prithvi which deals with Ghranendriya and its abode namely the nose. Physiology deals with normal functions of basic elements of the body and anatomy with the normal structure of basic elements of the body. Abnormality either in functions or in structure shows pathology. The Prithvi mahabhoota can be understood in this context. The external as well as internal anatomy of the nose is formed mainly by cartilages which are dominant in Prithvi Mahabhoota. The increase or decrease in the Prithvi Mahabhoota is the main causative factor for the pathological manifestations in the nasal diseases.

The intake of the excessive dry, cold and rough substances, the cause of increase in the prithvi manifests as dryness of the mucosal membrane of the nose. If hot substances have been taken in lesser quantity for a long time it does the same. For example if a paste is put in the open air it dries by virtue of dryness and coldness. While the same paste when put on the low flame continuously it leads to the rough transformation. Here, due to the dryness of the mucosal membrane, the secretion of mucosa (chemical gated channel of olfaction) decreases. So, smell cannot be perceived. In both these conditions, the hardness of Prithvi is increased. Hence, the treatment to decrease this hardness will be the softness present in the Akasha and the unctuousness of the Jala. Along with this, a slight presence of the hotness of the agni is desired as this the only cause of transformation. On the contrary, if the hardness is decreased, the softness is relatively increased. This increase implies the excessive secretion from the mucosa which further leads to impairment of olfaction. The line of treatment in such a situation is the hotness of Agni, concentration of Prithvi and dryness of Vayu. Hence, the drugs dominant in the pungent and astringent tastes along with those having the hot potency need to be prescribed.

5. Discussion and Conclusion

The Indian knowledge of the evolution described in the various schools of philosophy plays an important role in formulation of the basic principles of the indigenous system of medicine namely the Ayurveda. The development of Ayurveda has taken place with the ideas of the Indian Philosophies and their needful modifications like the
universal principle of the cause and effect \cite{19}. The concept of the \textit{Panchmahabhoota} is again a very fundamental and all pervading principle of Ayurveda. The different attributes of the \textit{Mahabhoota} and their normal functions are the main causative factor for the normal condition of the body. Vitiation of these properties or functions leads to impairment of the concerned entities like the senses according to the dominance of a particular \textit{Mahabhoota}. The theory of the \textit{Panchmahabhootha} is well valid for the special knowledge stream of the \textit{Shalakya Tantra of Ayurveda}. Each of the five \textit{mahabhoota} plays a unique role in the physiology, pathology and treatment. The \textit{Ayurveda} principle of the similitude and dissimilitude namely the \textit{Samanya and Vishesha} respectively utilizes the \textit{Panchmahabhootha} as an agent for the health and disease. The \textit{Vayu} represents the energy and activity, \textit{Akasha} represents the space, \textit{Agni} plays an important role in the treatment as it is the sole cause of transformation. In evolution theory \textit{Agni} placed in the middle of the \textit{Panchmahabhootha}, It shows that the function the \textit{Agni} is basically Transformation. \textit{Agni} dissolves \textit{Prithvi} and \textit{Jala} into \textit{Vayu} and \textit{Akasha}. \textit{Akasha} and \textit{Vayu} culminate into \textit{Jala} and \textit{Prithvi} with help of \textit{Agni}. Hence in treatment whenever \textit{Jala} and \textit{Prithvi} increase, the drugs which are dominant in \textit{Vayu} and \textit{Akasha} along with \textit{Agni} is desirable, while in diseases which is due to increased \textit{Vayu} and \textit{Akasha}, should be treated by drugs which have dominance of \textit{Jala} and \textit{Prithvi} along with \textit{Agni Mahabhootha}. If \textit{Agni} is increased \textit{Jala} and \textit{Prithvi} dominant drugs can be more useful and in decreased condition of the \textit{Agni} should be treated with \textit{Agni}, \textit{Vayu} and \textit{Akasha}. Thus, a pragmatic approach towards the \textit{Panchmahabhootha} which are the secret of the life shall ensure the health of the human being and can be the possible solution to the ailments of humanity. It is hence proved that the basics of Ayurveda are the very cause of its survival from the primary trisutra level to the contemporary progressive science \cite{20}.

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7. References