INTERNATIONAL RESEARCH JOURNAL OF AYURVEDA & YOGA

Website : www.irjay.com
E-mail : editor.irjay@gmail.com
ISSN : 2581-785X

Volume – 2, Issue- 1 (JAN-FEB) Review Articles

AN AYURVEDIC PURVIEW ON RESPIRATORY PHYSIOLOGY

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ABSTRACT-

Respiration is a vital function of the body. It is the process by which exchange of oxygen and carbon dioxidetakesplace. In this process oxygen is takenin and carbon dioxide is given out. The first breath takes place just after the birth. After the first one, the respiratory process continues throughout the life. The permanent stoppage of respiration occurs only at death. Respiration occurs in two stages inspiration*(Nishvas*) and expiration*(Ucchvas*). Inspiration is the process through which the air enters the lungs from atmosphere. Expiration is the process through whichthe air leaves the lungs i.e. expired out. In *Ayurveda*, it is the function of *Prana Vayu*responsible for the process of respiration in human body. *Prana Vayu* is compared with the atmospheric oxygen which is necessary to carry out the vital functions of life.*Prana Vayu* is inspired through *Pranvaha Srotas*during inspiration.

A clear explanation concerning the physiology of breathing in modern books dates back to the 16th century; but the physiology available in *Sharanghadhara Samhita*written by *Acharya Sharanghadhara*predates even that. Description of different parts of respiratory tract organs and functions are found in description of *Pratyanga Sharir, Srotas, Kosthanga,Prana Vata, Udana Vata, Rakta Dhatu*and diseases of *Nasa, Kantha, Pranavaha Srotas*etc.

Keywords: *Nishvas, Ucchvas, Prana Vayu, Pranavaha Srotas*.

INTRODUCTION

Human body is constituted by the trinity of *Dosha,Dhatu and Mala*.Among the *Tridosha,Vata* is responsible for all kinds of biological activities that are carried out in the human body[1]. *Tridosha*(in their normal as well as *Prakupita*state) move through all the *Srotas* of the body. According to *Sharanghadhara,*among the three *Dosha*, *Vata*is only onehaving *Gati* i.e. it possesses the capacity of movement. The movement of other two*Dosha* is also with the help of *Vata*. According to *Charaka,*the respiratory movements like inspiration &expiration are due to *Vata*[2].

In Ayurveda the process of respiration (in humans) is attributed to the functions of *Prana Vayu*. In some places, *Prana Vayu*is compared with the inspiration of atmospheric air, while *Apana* is said to be the representative of expiratory exhalation of accumulated CO_2. *PranaVayu* is inspired through *Pranvaha Srotas*during inspiration[3].

*Prana*is located in the head and moves through the chest & throat. It regulates will power, heart, sense organs, intellect and vision. It is the cause for expectoration, sneezing, belching, inspiration and swallowing of food.

FUNCTIONAL ANATOMY OF THE RESPIRATORYSYSTEM:

The organs of the respiratory system include the nose, nasal cavity, pharynx, larynx, trachea, bronchi, their smaller branches and the lungs which contain the terminal air sacs or alveoli. The places of *Prana Vayu*for respiration as described in *Ayurveda* were also same as *Murdha* (head), *Nasika*(nose & nasal cavity),*Kantha* (trachea & larynx) &*Uras* (thorax).

Mouth cavity(*Mukhavivara*):

Sushruta has described it as *Vaktra*. *Prana Vayu* moves in and through the mouth cavity. It can be assumed to have fair amount of control over the functions governing the buccal cavity like chewing, deglutition, etc.

Nose (*Nasika*):

The only externally visible part of the respiratory system, the nose lies in the middle of the cranium & mouth. Posteriorly it communicates with the pharynx. It is the sense organ of smell / olfactory receptors (*Ghranendriya).Acharya Sushruta* has described *Nasa* under *Pratyanga* and said it to be one in number. Two orifices in *Nasa* which could be related to *Nasachidra.Prana Vata* also has control over the functions of *Nasa*, as evident by inspiration and during pathology of *Prana Vata* (as in sneezing).

Throat(*Kantha*):

*Kantha*word is used for throat, oropharynx. In the process of respiration, *Kantha*plays an important role, which is the *Shvasana Path* (the part of the upper respiratory tract). *Acharya Sharangdhara*has described *Kantha* in the context of respiration.

Pharynx(*Grasanika)*:

Pharynx is a funnel shaped structure which connects the nasal cavity &mouth to the larynx &oesophagus inferiorly. It is a common passage for air (through Pharynx & Trachea, the canal for air) & food (through oesophagus).

Larynx(*Swaryantra*):

The larynx, commonly called the voice box, is an organ in the top of the neck of tetrapod's involved in breathing, producing sound, and protecting the trachea against food aspiration. Larynx is situated between Pharynx& trachea. It acts as a passage of air to the respiratory system & food to the oesophagus. Besides this, it plays a very important role in the production of voice. During swallowing its inlet is closed by epiglottis.

Trachea (*Klomanadi*):

Gananatha Sen said *Klomanadi*is *Swaspranali* (trachea). *Vayu* enters through *Mukha* and *Nasika* passage through *Klomanadi*(trachea), *Apastambha*(bronchi) and finally *in Phupphus*(lungs)It is 10-12 cm long. Trachea is the continuation of larynx and ends in getting divided into 2 principle bronchi in the mid thorax.

Bronchi *(Apasthambh*):

The trachea is divided into 2 parts – viz. left & right bronchi at about at the level of 5th vertebra of the thorax in themediastinum. Both the primary bronchi entereach site of the lung; vary in shape accordingto the location of the lung. After enteringthe lung each primary bronchus divides intosecondary, tertiary bronchi and bronchiolesand terminal bronchioles. On both sides of chest there are two *Vata* carrying *Nadi*(bronchi) known as *Apasthambh*[4], due to injury on it, causes death by filling of air in chest (pneumothorax) or cough or dyspnoea.

Lungs *(Phupphus*):

In *Ayurveda*, *Acharya Sushruta* describes the lungs to be produced from the foam of the blood, whereas in the modern medicine it is described as two lungs one lying on each side of the mid line of the thoracic cavity. They are cone shaped and described as having an apex, a base, costal surface and medial surface. *Sushruta* described *Phupphusa* as one of the eight *Koshthanga*. On the left and inferior aspect of heart are *Pliha and Phupphusa*, while on the right side are *Yakrita* and *Kloma*[5].

According to *Sharangdhara* in the left side of the body *Phupphusa*, *Pliha* and in the right side *Vakrita* is situated, intellect people stated *Phupphusa* as *Udanavayu-Adhara* and function of *Udana Vayu* is *Ucchavas*. So, it is clear that *Phupphusa* are related to respiration. Thus, only *Sharangadhara* has directly described the relation of lungs with ventilation[6].

The alveoli:

The remote small ends of bronchioles are further subdivided into the minute cavities called alveoli which end again at alveolar sac in the lungs. This portion of the lung is directly responsible for exchange of inhaled gases.

The pleura:

The pleura is thin, double layered membrane which covers the lungs it produces pleural fluid, a lubricating serous secretion which remains between the two layers and the lungs easily glided at respiration.

***Pranavaha srotas*:**

The physiological importance of *Pranavaha Srotas*is much higher than other *Srotas* so it is described first. *Prana*

is very important forliving body and this *Prana* is carried by *Pranavaha Srotas*. The external air which is inspired through nose is called as *Prana* and the body is alive with this *Prana*. If there is disturbance or break in this *Vayu*, man willbe dead. So, it is called *Prana Vayu*. *Srotas* are the channel or structure through which *Sravan Karma* takes place.

Acharaya Charaka has described that *Moolastana* of *Pranavaha Srotas* are *Hridaya* (heart) and *Mahasrotas*[7](alimentary canal)·whereas*Sushruta* stated *Hridaya*(heart) and *Rasavahi Dhamani*(blood vessels) as the*mool*[8]. Most of the recent authors have correlated "Respiratory System" with *Pranavaha Srotas* on the basis of features of *Pranavaha Srotodusti* with symptoms of respiratory system diseases. *Pranavaha Srotodusti* produces various symptoms like *Atisrutam*(increase rate of breathing), *Atibaddha* (difficulty in breathing), *Kupitam, Alpam* or *Abhiksanam*(breathing pattern is short with increased frequency), *Sasahabdashula*(breathing associated with sound and pain) etc. which shows similarity with various respiratory diseases like as *Swasa, Kasa* etc[9].

Respiration:

Ayurveda's description of "Respiration" is very precise and somewhat poetic. It says that the *Pranavayu* from the *"Nabhi*" region traverses through the Throat and passes out to consume the nectar in the air from atmosphere and comes back quickly to nourish the body to attain longevity. To understand the whole respiratory mechanism as described by *Sharanghadhara* we must understand the function of *Prana Vata, Udana Vata, Kapha, Rasa, Rakta, Mamsa, Asthi, Majja and Mala.*

Prana Vata:

Prana is located in the head and moves in the chest, throat. It regulates will power, heart, sense organs, intellect and vision. It is the cause for expectoration, sneezing, belching, inspiration and swallowing of food[10].

Prana Vata is considered as the force that takes care of functioning of heart, lungs and throat (swallowing, belching etc.).*Prana Vata*, in a broad sense, can be compared to the CNS anatomically and physiologically as its main seat is *Murdha* and controls almost all the physical and physiological functions by generating motor impulses after the integration of the sensory impulses from all over the body.

Udana Vayu:

The chest is the seat of *Udana*.It moves in the nose, umbilicus and throat; its function includes initiation of speech, efforts, enthusiasm, strength, color, complexion and memory[11].*UdanaVata* is correlated with breath and process of respiration. Major groups of muscles that take part in speech and respiration are located in the mouth and throat and the nerve fibres supplying these areas can be correlated with *Udana Vata*.

Development of speech is associated with neuro-physiological phenomenon of learning which occurs as an integrated outcome of motivation, emotion, and sensory adaptation in terms of performance of an individual. Apart from this,*Ayurveda* opines that this physiological phenomenon acts through

Mana and *Buddhi*. So, a stimulus may reach higher centres in *Mastishka* from the *Kantha, Uras, Nabhi Sthana* through *Udana* because of its nature (moving upward) and as said earlier integration of stimulus is done through *Prana Vata* and a motor impulse may be sent to muscles of the above said *Sthana* where the movement of muscles occur due to *Vyana Vata*. Hence it is clear that *UdanaVata* performs its functions through the combined functioning of *Prana* and *Vyana Vata.*

***Kapha*:**

Due to *Kapha*, heart and lungs can function for longer time, contraction and relaxation occurs smoothly[12].

***Rasa, Rakta, Mamsa, Asthi, Majja* and *Mala*:**

These body tissues are closely related with the respiration. Normal respiration depends upon, normal anatomy and normal *Dosha*, *Dathu* and *Mala* functions. Normal physiology depends on normal anatomy.

***Shavashan Prakriya*(Respiration Process):**

Sharangadhara has explained this procedure in brief. *Prana-Pavan*(*Prana Vayu*) from umbilical region, after touching *Hritkamala* goes out through *Kantha*. Then it reaches *Vishnupada* and after drinking *Ambara-Piyusha* (oxygen), speedily comes back*(Punarayati Vegatah*)[13]. Then this *Prana Vayu* carries out the function like *Prinana, Jivana* and stimulates *Jatharanala* or *Jatharagni* (stimulation of digestive fire i.e. stimulation of oxidation process). In this verse of *Sharngadhara* explains many important steps of respiratory system physiology systematically which are as follows:

Ventilatory mechanism:

Ventilation, the movement of air between the environment and lungs via inhalation and exhalation. The word *"Nabhi*" explain the Participation of diaphragm, lungs and abdominal muscles in the process of ventilation.

Gaseous exchange:

Alveoli are the primary sites of exchange of gases. Exchange of gases also occurs between blood and tissues. O_2 and CO_2 are exchanged in these sites by simple diffusion mainly based on pressure/concentration gradient. *"Spristvahritakamalantram*" word indicates the gaseous exchange at the alveoli, after that the impure air comes outside through the *Kantha*(throat,Nasopharynx). Here word *"Hritakamalantar*" could be synonymous for lungs as *Ambar-piyush* word is used for oxygen.

Regulation of Respiration

The basic control of breathing is governed by the activities of neurons of medulla & pons. The respiratory centres in the Medulla & Pons are sensitive to both excitatory & inhibitory stimuli. The Pneumotaxic centre influences the activity of medullary inspiratory centre. The *Prana Vayu* stated at *Murdha* (head) or brain control *Swasa* (respiration) & other modification of it for example*Ksavathu* (sneezing) etc. activities.

According to *Charaka Samhita* the increased & decreases number of *Swasana* (respiration) is found in the internal covering (*Avarana*) of *Vayu Dosa*. Thus, the *Prana Vayu* seated at *Murdha* (brain)

controls the *Swasana Karma* in life. Health (*Swasthya*) belongs to thehaemostatic interrelationship (*Dhatusamya*) in all the systems of the body. *Prana Vayu*plays very important role in its maintenance.In fact, the *Shwasana* is a well-known carrier of *Prana Vayu* (*Nabhistha Prana Pawanah*) which is the key point of life & without the proper supply of air the O_2 cannot be absorbedby the blood[14].

Transportation of gases:

In *Pranavaha Srotasmool*, external *Prana Dravya* is converted into absorbable form and then it is transported with *Rakta* throughout the body *"Prano hi Raktamanudhavati"*[15]. Blood is the medium of transport for O_2 and CO_2. About 97 percent of O_2 is transported by RBCs in the blood. The remaining 3 percent of O_2 is carried in a dissolved state through the plasma. Nearly 20-25 percent of CO_2 is transported by RBCs whereas 70 percent of it carried as bicarbonate. About 7 percent of CO_2 is carried in a dissolved state through plasma.

Kshut(sneezing):

*Kshut i*s the sound produced in the nose by upward movement of *Prana* and *Udana Vayu* and *Kapha* in the head[16]. This description could be understood as sneezing relax for clearance of upper respiratory tract.

Respiratory rate:

A person's respiratory rate is the number of breaths which taken by him per minute. The normal respiration rate for an adult at rest is 12 to 20 breaths per minute.

References:-

Artificial respiration*(Pranapratyagaman*):

Artificial respiration is the restoration or initiation of someone's breathing by manual, mechanical, or mouth to mouth methods. In*Sharirsthana, Charaka* has given various measures for resuscitation of just new born baby for establishment of respiration.

CONCLUSION:

Respiration is a vital processnecessary for the survival of the living beings. From ancient *Samhita* to modern studies, loads of literature is available on this very specific process, which keeps humans alive. In *Ayurveda*, *Prana Vata* located in the Head and traversing through the *Nasa*, *Nabhi* and *Gala/Kantha* is said to be responsible for the functioning of inspiration and expiration as well as a plethora of other functions like deglutition, sneezing, belching, *Dharana* of *Mana*, *Hridaya* and *Dhamani*. Knowing the underlying mechanism of respiration in Ayurveda is vital to the understanding of respiratory disorders like Shwasa, Kasa etc. as well as the rational picking and usage of medicines in the management of the same. This article reviews the process of respiration in *Ayurveda* literature along with the discussion on related organs. Further studies exploring the clinical aspect of the *Shwasa Prakriya* in *Ayurveda* need to be planned and carried out to benefit the masses.

1.Agnivesh; Charak Samhita, Ayurveda Depika Commentary by Sri Chakrapanidutta edited by Pt. Yadavji Trikamji Acharya, Chaukhamba Surbharti Prakashan, Varanasi, Reprint 2007; Sutra Sthan 12/8;
2.Agnivesh; Charak Samhita, Ayurveda Depika Commentary by Sri Chakrapanidutta edited by Pt. Yadavji Trikamji Acharya, Chaukhamba Surbharti Prakashan, Varanasi, Reprint 2007; Sutra Sthan 18/49;
3. Vagbhat, Ashtanga Hridaya, Sarvangsundra and Ayurveda Rasayan Commentary of Arundutta and Hemadri, Bhisagacharya Pt. Hari Sadashiva Paradakara, Chaukhamba Surbharti Prakashan, Varanasi, 2014, Sutra Sthan 12/4;
4, 5. Sushruta; Sushruta samhita, Nibandhasangrah Commentary by Dalhan edited by Yadavji Trikamji Acharya, Chaukhamba Surbharti Prakashan, Varanasi, 2014;
6. Sharangdhar Samhita, english translation by Murthy K.R.S, editors,Varanasi: Chaukhambha Orientalia: Reprint 2009.
7.Agnivesh; Charak Samhita, Ayurveda Depika Commentary by Sri Chakrapanidutta edited by Pt. Yadavji Trikamji Acharya, Chaukhamba Surbharti Prakashan, Varanasi, Reprint 2007;
8. Sushruta; Sushruta samhita, Nibandhasangrah Commentary by Dalhan edited by Yadavji Trikamji Acharya, Chaukhamba Surbharti Prakashan, Varanasi, 2014;
9. Agnivesh; Charak Samhita, Ayurveda Depika Commentary by Sri Chakrapanidutta edited by Pt. Yadavji Trikamji Acharya, Chaukhamba Surbharti Prakashan, Varanasi, Reprint 2007;
10, 11, 12Vagbhat, Ashtanga Hridaya, Sarvangsundra and Ayurveda Rasayan Commentary of Arundutta and Hemadri, Bhisagacharya Pt. Hari Sadashiva Paradakara, Chaukhamba Surbharti Prakashan, Varanasi, 2014;
13. Sharangdhar Samhita, english translation by Murthy K.R.S, editors,Varanasi: Chaukhambha Orientalia: Reprint 2009.
14. Ayurvediya Kriya Sharira, Mishra Y.C, editors Varanasi: Chaukambha Sanskrit Sansthan; 1st edition 2008. P 175-176
15. Agnivesh; Charak Samhita, Ayurveda Depika Commentary by Sri Chakrapanidutta edited by Pt. Yadavji Trikamji Acharya, Chaukhamba Surbharti Prakashan, Varanasi, Reprint 2007;
16. Sharangdhar Samhita, english translation by Murthy K.R.S, editors,Varanasi: Chaukhambha Orientalia: Reprint 2009.