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# Narrative review to unravel the link between symptoms and components of pathogenesis (*Samprapti Ghatak*) of *Tamak Swasa* (bronchial asthma)

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## ABSTRACT

*Tamak Swasa* is a disorder of *Pranavaha Srotas*. It highly correlates with the clinical picture of bronchial asthma. The non-recognition of *Tamak Swasa* in the early stages may lead to worsening of symptoms, frequent attacks of *Swasa*, and decreased quality of life. It is highly essential to recognize the underlying pathology and related *Samprapti Ghataka* (components of pathogenesis) based on clinical signs and symptoms of *asthma*. This understanding helps a physician to choose the most appropriate therapeutic approach. This review aims to explain the underlying pathology of symptoms of *Tamak Swasa*. A literature search was performed referring *Bruhatrayee*, *Laghutrayee*, and all other available classical texts of *Ayurveda*. Published articles were referred to using PubMed and google scholar search. This review analyzed that *Vegavastha* (exacerbation) and *Avegavastha* are important milestones of treatment. Identification of involvement of *Vata* and or *Kapha Dosha*, *Avaranajanya Samprapti* (obstructed pathology), types of *Srotodushti* (*Srotas* are the channels of transportation), deteriorated status of *Jatharagni* and functionality of *Apan Vayu* (a subtype of *Vata Dosha*) found to be vital components of pathogenesis linked with the major symptoms responsible for the manifestation of serious exacerbation stage of *Tamak Swasa*.

**Key words:** *Samprapti, Lakshan, Ayurved, components of pathogenesis, bronchial asthma.*

## INTRODUCTION

*Hetu, Ling, and Aushadhi* are *Trisutras* of *Ayurved*.<sup>[1]</sup>

These factors play an important role in the diagnosis and treatment of any disease. Symptoms are more important in the diagnosis of disease. The disease is

mentioned as *Lakshan Samucchaya* i.e., group of symptoms. Every symptom is the repercussion of the underlying pathology of the disease. Underlying pathogenesis starts from the indulgence of *Nidana* (causative factors) and it goes on till the appearance of *Lakshnas* (symptoms). For treatment purpose, it is essential to find out this underlying pathology based on symptoms. '*Samprapti Vighatanam Eva Chikitsa*' Treatment based on *Samprapti Vighatan* gives complete relief from disease and it never reappears as long as *Hetu-Sevan* (exposure to etiological factors) is restricted.

*Darshan* (inspection), *Sparshana* (palpation and percussion by touching), and *Prashna* (interrogation) are used as a tool for assessment of patient whereas *Nidan Panchak* is used as a tool for assessment and to diagnose the disease. While mentioning *Nidan Panchak* (five stages to evaluate disease), general

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pathogenesis (*Samanya Samprapti*) of disease is mentioned in classics along with symptoms, but in practice, it is observed that patient may not be having all symptoms of disease mentioned in classics. In this condition, it is very essential to identify the signs and symptoms of the patient and confirm the underlying pathogenesis accordingly. It will provide us a complete picture of the disease status of patient. Here an attempt is made to illustrate the underlying pathology of every symptom of *Tamak Swasa* mentioned in classics.

## MATERIAL AND METHODS

Ayurveda classics like *Bruhatrayee* and *Laghutrayee* were referred. Electronic search engines like Google Scholar, PubMed were also searched for relevant data. Collected data was then analyzed to trace the underlying pathogenesis for the related symptoms.

## DISCUSSION

Ancient classics have described the *Tamak Swasa* (bronchial asthma) as a type of *Swasa* disease. After an explanation of general manifestation of *Swasa*, *Acharya Charak* has described the pathogenesis and symptomatology of *Tamak Swasa* separately. Symptoms of *Tamak Swasa* find a correlation with bronchial asthma in allopathic medicine. They are discussed below to explore the underlying pathogenesis.

***Greeva Shirascha Sangrihya*** (stiffness in the neck and head)

This symptom appears due to *Vataprakopa*. *Sankocha* is appeared due to vitiated *Vata*.<sup>[2]</sup> It may also be due to *Snayugata Vata* causing spasm of neck muscle, manifested as *Griva* and *Shirasosangrihya*.<sup>[3]</sup>

Stiffness in the neck and head is observed during acute exacerbation of bronchial asthma. In this stage, patients are suffering from severe dyspnea. To compensate for increased demand additional muscles of respiration are working. Here neck muscle e.g., sternocleidomastoid gets contracted to lead to stiffness of the neck and head region. McFadden et al in their study revealed that consistent retraction of the

sternocleidomastoid muscle is an important sign to identify the severe impairment of pulmonary function.<sup>[4]</sup>

***Peenasam Karoti*** (rhinorrhea)

Vitiated *Vata* when enters the *Pranavaha Srotas* (channels carrying prana), deranges the *Kapha* situated in the *Urahsthan* (chest region). This aggravated *Kapha* results in *Peenasa*. A survey study conducted by Ohta K et. al observed severe rhinitis as one of the major factors associated with asthma exacerbations.<sup>[5]</sup>

***Ghurghurakam*** (*Kanthe Ghurghurak Shabdham-Chakrapani*) (wheeze)

It appears due to the vitiated *Kapha*, which obstructs normal flow of *Vayu*. This symptom appears due to *Srotorodha* (obstruction of airways) and it is produced during breathing. Sometimes vitiated *Vata* due to *Srotosankoch* (bronchospasm) leads to narrowing of channels, which produces wheezing sound.

Wheezing may result from localized or diffuse airway narrowing or obstruction from the level of the larynx to the small bronchi. The airway narrowing may be caused by bronchoconstriction, mucosal edema, external compression, or tenacious secretions.<sup>[6]</sup> Wheezing is observed as a major symptom of an asthma attack.<sup>[7]</sup>

***Ativ Tivra Vegam Swasa*** (Exceedingly severe attack afflicts the *Prana* and enhances severity)

*Tamaka Swasa* has been described as a disease occurring in *Vegavastha* (paroxysmal attack). This is "*Pratyatma Lakshana*" (cardinal symptom) of *Tamak Swasa*. Word *Tivra* is used to express more distress during respiration. Spasm of smooth muscle and mucus plug formation in airway obstructs airway. Due to this obstruction, less amount of *Prana Vayu* enters the body. To compensate for the required amount of *Prana*, rate of respiration is markedly increased which is explained as *Ativa Tivra Swasa*.

***Pratamyati Aivegat Kaasate Sanniruddhyate*** (During severe coughing, patient faints repeatedly)

The patient gets repeated attacks of fainting during continuous coughing which if continue for a longer

period causes distress to the patient. Many theories have proposed to explain the probable mechanism behind the loss of consciousness following cough: various consequences of the marked elevation of intrathoracic pressures induced by coughing: diminished cardiac output causing decreased systemic blood pressure and, consequently, cerebral hypoperfusion; neurally mediated reflex vasodepressor-bradycardia response to cough are some of them.<sup>[8]</sup>

**Shlesma Mucchyamane Bhrisam Bhavati Dukham / Shlesma Vimokshante Muhurtam Sukham** (The patient finds it difficult to expectorate the phlegm and feels relieved for nearly an hour after expectoration):

'*Stheevana*' is the function of *PranaVayu*.<sup>[9]</sup> In *Tamaka Swasa*, vitiated *Kapha* obstructs the natural course of *Vayu* leading to aggravation due to *Avarana*. Further *Ruksh Guna of Vayu* changes the nature of *Kapha* and it becomes sticky, hence cannot expel easily.<sup>[10]</sup> This *Avaranjanya Vayu* tries to expel this *Kapha*, which induces pain. This symptom also differs according to underlying pathogenesis. If underlying *Samprapti* has a dominance of *Kapha*, *Kapha* will be vitiated from the beginning due to its etiological factors. Vitiated *Kapha* further obstructs the natural course of *Vayu*. This results in the expulsion of a large amount of *Kapha* after little coughing and the patient gets relief after expectoration.<sup>[11]</sup> In another pathogenesis dominance of *Vata* is observed and *Kapha* is in a normal state. Vitiated *Vata* causes vitiation of *Kapha Dosha*. This aggravated *Kapha* causes *Avarana of Vata* (obstructing *Vata Dosha*). In such cases, there will be vigorous coughing leading to less or no expectoration and the condition becomes very painful.

**Udvasate Kanthah** (hoarseness of voice)

Due to intense coughing and *Vata Prakopa*, dryness occurs in mouth and irritation in throat region results in hoarseness of voice.

**Krucchrat Shaknoti Bhashitum** (speaks with difficulty)

'*Vakpravritti*' (speech) is the main function of *Udana Vayu*.<sup>[12]</sup> In *Swasa*, vitiated *Kapha* in *Urasthana* obstructs the natural course of *Udana Vayu* leading to

*Avaranjanya Karmahani* (deterioration of natural functions due to obstruction), which results in difficulty in talking (*Krucchrat Bhasitam*).

While mentioning symptoms of *Kaphavrita Udana*,<sup>[13]</sup> *Vakaswar-Graha* (dysarthria) is mentioned which explains the role of *Udana Vayu* in the pathogenesis. Intense coughing and breathlessness result in hoarseness of voice and the patient feels difficulty in talking. Tenacious mucous coated in the throat including vocal cord leads to difficulty in speaking.

**Shayane Swasa Pidotam / Na Cha Api Nidra Labhate** (does not get proper sleep, and on lying down suffers from dyspnea):

During exacerbation of asthma, ventilation of air in alveoli reduced in lying down posture. Lungs are not fully expanded; diaphragm moves in upward direction rather abdominal pressure is created on it. Hence surface area available for ventilation is also reduced and secretions obstruct the airways leading to dyspnea and cough. Due to cough and dyspnea person doesn't get proper sleep.

In patients with asthma, dyspnea is caused by airway obstruction. Antonelli A. et. al have observed that dyspnea increased with the severity of obstruction, mostly because of inspiratory effort and chest tightness. The trigger for chest tightness in asthma could be either chemical or mechanical. The inspiratory effort is found to be originated from an increase in motor command to inspiratory muscles working at increased lung volumes because of dynamic hyperinflation.<sup>[14]</sup> Loughheed and O'Donnell found that dyspnea and lung hyperinflation are increased during induced bronchoconstriction.<sup>[15]</sup>

**Shayane Parshva Graha** (on lying down suffers from dyspnea as flanks are afflicted by *Vayu*):

Acharya Sushruta while describing *Parshvshula* explains that *Vata* gets obstructed due to *Kapha*, manifesting *Parshvashula*<sup>[16]</sup> (intercostal pain), *Graha* (stiffness), and *Shula* (severe pain). *Vata* is obstructed due to *Avarana of Kapha*, which leads to *Parshvshula / Graha*.

**Asino Labhate Saukhyam Shayanah Swasa Piditah** (feels comfortable in the seating position, on lying down suffers from dyspnea)

During an asthmatic attack, the patient prefers a seating posture to any other position. Sleeping posture aggravates the exacerbation state. In seating posture diaphragm is lowered hence secretions do not obstruct the airways completely. There will be more space for gaseous exchange. Hence patient gets relief while seated. This condition is referred to as orthopnoea usually reported in the cases of status asthmaticus.

**Ushnam Abhinandati** (likes hot things)

The predominance of *Kapha* is there in the *Samprapti* with or without the involvement of *Vata Dosha*. Both the *Doshas* are having *Sheeta Guna*. *Ushna Guna*, which is opposite to *Sheeta Guna*, pacifies *Vata* and *Kapha Dosha*. So, patients of *Tamaka Swasa* like warm articles such as tea, coffee, hot water, etc.

**Ucchritaksha** (face holding upward/bloated eyes)

When proper oxygenation is hampered due to obstruction in the airways, there may be gasping for air to meet the oxygen demand. The patient holds the face upward to facilitate straitening of the airways. Hence, he keeps his eyes open as he is in apprehension.

**Lalate Sweda** (sweat on the forehead)

This clinical feature of asthmatic attack indicates exertion due to rapid respiration. *Acharya Sushruta* instead of *Lalate Sweda* mentions only *Sweda*,<sup>[17]</sup> which generally indicates the perspiration of whole body. *Lalate Sweda* is due to extra efforts taken to meet oxygen demand. *Lalate Sweda* is also indicated in symptoms of *Ardha Shakti Vyayama*.<sup>[18]</sup>

**Bhrusham Aratimana** (severe restlessness)

During the attack of *Tamak Swasa*, the patient cannot perform respiration properly as he is under great distress. This causes excess mental restlessness.

**Vishushkasyata** (dryness of the mouth)

Due to rapid breathing sometimes, patient tries to get maximum amount of air through the mouth leading to dryness of mouth. Due to rapid breathing heat loss is

also more through respiration. *Acharya Sushruta* mentioned *Trita* (thrust) as *Lakshana* of *Tamaka Swasa*.

**Muhurmuhu Swasa** (Gasping Type of Respiration)

To fulfill the oxygen demand, the respiratory rate is increased. The patient may have a gasping type of respiration; this is a grave condition that may occur in the terminal stage of the disease.

Hypoxia alters the respiratory network. Peña F has studied the neuronal network properties underlying the generation of gasping. The pre-Bötzinger complex (preBötC) is a cluster of interneurons in the ventral respiratory group of the medulla of the brainstem. This complex is essential for the generation of the respiratory rhythm in mammals. During severe hypoxia, the network properties within the PreBötC are reconfigured whereby the network no longer generates eupnoea but instead generates a new rhythm, named gasping. Such reconfiguration includes changes in synaptic and intrinsic properties triggered by hypoxia itself, as well as the influence of different neuromodulators released during hypoxia. Gasping has been considered an important arousal mechanism that triggers autoresuscitation.<sup>[19]</sup>

**Muhu Cha Eva Avadhmyate** (stir up)

मुहुश्चैवावधम्यते इति क्षणं क्षणं श्वसनेन वायुनाऽवधम्यते |  
*Chakrapani*

The body moves along with respiration during an attack. Due to starvation of air, patient tries to inhale a large amount of air inside. For this purpose, the trunk is raised, and during expiration, it is lowered. *Acharya Gangadhara* explained this phenomenon as the movement of a person traveling on an elephant.

**Meghambu - Sheet Prakvate Shlesmalai Cha Abhivardhate** (aggravating factors)

The predominance of *Kapha* and *Vata Dosha* is observed in *Tamaka Swasa*. *Vata* and *Kapha* aggravating factors further worsen the condition of *Swasa*.

*Meghambu*: While explaining the seasonal impact on body physiology, *Chakrapani* opines that a cloudy

atmosphere leads to an aggravation of *Kapha* and *Vata Dosh*, which are the prime *Dosh*s in the etiopathogenesis of *Swasa*.<sup>[20]</sup>

*Sheeta*: Being an inherent property of *Dosh*a it aggravates *Kapha* and *Vata Dosh*a.

*Prag Vata*: Directly acts as *Preraka Nidana* (stimulating cause) for *Swasa*.

The research findings have substantiated the importance of cold weather as a trigger in the pathogenesis of rhinitis, and the development of asthma. Cold air hyperpnea provokes bronchoconstriction in asthmatic subjects. Cold air hyperventilation also provokes coughing in susceptible people.<sup>[21,22]</sup> A study has demonstrated that a few hours of exposure to cold air increases the number of inflammatory cells (granulocytes and macrophages) in the lungs.<sup>[23]</sup> Another study has revealed the mechanism of cold air effect concluded that the long-term exposure to cold exposure induces airways alterations, increased prevalence of airway hyperresponsiveness, increase in airway fluid osmolarity following hyperpnoea, increase in bronchoalveolar lavage fluid granulocytes, loss of ciliated epithelium, thickening of the lamina propria with increased concentrations of inflammatory cells.<sup>[24]</sup> It is also reported that cold damp air causes more symptoms than cold dry air in asthmatic patients. Along with cold air, other meteorological variables like humidity, visibility, cloud cover, air pressure, wind speed, and others in combinations are referred to as “synoptic air masses”, known to influence morbidity conditions like asthma.<sup>[25]</sup>

#### Essential component of pathogenesis (*Samprapti Ghataka*)

The components involved in the pathogenesis of *Tamak Swasa* and mentioned in various classics are comprehended in the below-given table.

**Table 1: Components of Pathogenesis of Tamak Swasa highlighted in classics**

<b>Dosha</b>	<i>Vata-Prana Vayu</i> (involves predominantly), followed by <i>Udana</i> , <i>Samana</i> and <i>Apana Vayu</i> <sup>[26]</sup>
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	<i>Kapha- Kledaka</i> and <i>Avalambaka Kapha</i>
<b>Dushya</b>	<i>Udaka</i> , <i>Rasa Dhatu</i> , <i>Rakta Dhatu</i>
<b>Agni</b>	Status of <i>Jatharagni - Mandagni</i> , <i>Vishamagni</i> <i>Dhatvagni - Rasa Dhatvagnimandya</i>
<b>Srotasa</b>	<i>Pranavaha</i> <sup>[28]</sup> , <i>Udakavaha</i> <sup>[29]</sup> , <i>Annavaha</i> <sup>[30]</sup>
<b>Udbhavasthana</b>	<i>Pittasthana</i> <sup>[31]</sup> , <i>Aamashaya</i> <sup>[32]</sup>
<b>Vyaktisthana</b>	<i>Urah</i> , <i>Phupphusa</i> (lungs), <i>Pranavaha Srotas</i>
<b>Srotodusti</b>	<i>Sanga</i> , <i>Vimarg-gamana</i> and <i>Atipravritti</i>
<b>Rogamarga</b>	<i>Abhyantara</i>

The role of every component of pathogenesis (*Samprapti Ghatak*) to manifest *Tamak Swasa* is discussed below-

**Udbhavasthana and Vyaktishtan** (site of origin and manifestation): *Aamashaya* and *Pranavaha Srotasa* are mainly involved in the pathogenesis, Embryological development also indicates that both lungs and the stomach develops from one bud and are later divided into two compartments. Both the organs are having the same parasympathetic stimulus hence both are interrelated.

**Dosha**: *Vata* and *Kapha Dosh*a are involved in pathogenesis. Among subtypes of *Vata Dosh*a, *Prana Vayu* is dominant followed by *Udana*, *Samana*, and *Apana Vayu*. *Acharya Vagbhata* opined that vitiation of *Prana Vayu* leads to development of *Swasa*.<sup>[26]</sup> The respiration process, which is under the control of *Prana Vayu*, gets disturbed in *Swasa*. *Udana Vayu* is situated around *Nabhi* (umbilicus) and *Urah Pradesha*, which gets associated with *prana Vayu*. *Samana Vayu* is mainly related to the balance of fluid parts in body i.e., *Udakavaha Srotas* as well as it plays a major role in the deterioration of *Jatharagni*.

**Dushya**: *Udaka*, *Rasa*, and *Rakta* are primarily involved in pathogenesis. *Udaka* mainly relates to the fluid part of the body. *Hridaya* is the second organ involved which is the root of *Rasavaha Srotasa*. Site of manifestation, *Phupphusa* (lungs) is an organ evolved from *Raktaphena*<sup>[27]</sup> (froth of *Rakta Dhatu*) (*Shonit Phena Prabhavah Phupphusah I*)

**Srotasa:** *Pranavaha Srotasa* is a primary component of pathogenesis of *Tamaka Swasa*.<sup>[28]</sup> Chakrapani has mentioned the involvement of *Pranavaha* and *Udakavaha Srotasa* in *Swasa*.<sup>[29]</sup> Acharya Vagbhata has also mentioned the involvement of *Prana, Anna,* and *Udakavaha Srotasa*.<sup>[30]</sup> Thus, *Prana, Anna,* and *Udakavaha Srotasa* are to be considered in the pathogenesis of *Swasa* disease.

**Srotodushti:** *Sanga, Atipravritti* and *Vimargagamana* are the types of *Srotodushti* responsible for manifestation of *Tamaka Swasa*. Vitiating *Vayu* moving in reverse direction pervades the *Pranavaha Srotasa*. *Vayu* gets obstructed by *Kapha* in its course which further vitiates *Prana Vayu* resulting in *Atipravritti* and *Vimarg Gamana*.

**Agni:** In the initial stage, *Agnimandya* is one of the fundamental causes for vitiation of *Doshas* which leads to formation of *Aam*. *Udbhavasthan* of *Swasa* is *Amashaya*. Hence the status of *Jathragni* is pivotal in controlling the disease. Vitiation of *Vata* and *Kapha Dosh* in a later stage further deteriorates the status of *Jathragni*.

The above discussed symptomatology of the disease is initially classified based on *Vegavastha* (exacerbation) and *Avegavastha*. Specific symptoms appear only during *Vegavastha*. Stiffness in the neck and head, sweat on the forehead, severe dyspnea, repeated fainting, difficulty in speech, ceasing of breath, upward holding of face, dryness of the mouth, severe restlessness these symptoms are predominantly observed during exacerbation. *Sroto-Sankocha* (obstruction of the airway) caused due to vitiation of *Vata Dosh*, vitiation of *Kapha* obstructing the functioning of *Vayu*, an increase of *Abhishyandi Guna* results in excess oozing from walls of *Srotas* are the probable factors responsible for exacerbation.

## CONCLUSION

Thus, it can be said that *Tamak Swasa* though manifest in *Pranavah Srotas*, originates in *Amashaya*. Knowledge of underlying pathology for specific symptoms helps physician to finalize the treatment protocol more precisely. Knowledge of *Vegavastha*

and *Avegavastha* has utmost importance because treatment modalities will differ during the stage of *Vegavastha* (exacerbation). *Agni Deepan, Kapha Shaman, Vatanuloman, Bruhan* and *Shaman* therapies need to be adopted as per the different stages of the disease.

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