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Review Article

RESPIRATORY SYMPTOMS AS SEQUELAE OF FEVER - AN AYURVEDIC INSIGHT

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ABSTRACT

Respiratory symptoms are one of the most prevalent clinical presentations in the current scenario. These symptoms often emerge following viral or bacterial infections, typically accompanied by fever. Certain antimicrobial therapy only destroys the pathological factors, but the impact created by the organism persists in the body, later manifesting as sequelae in different systems. In the respiratory system, it is exhibited in the form of cough, dyspnoea, and wheezing. The Ayurvedic classical text also documents similar observations in the context of *Jvara Upadrava*, highlighting respiratory issues such as *Swasa*, *Kasa*, and *Hikka*. This is an approach to narrate the modified pathophysiology of respiratory symptoms that occur as sequelae of fever through Ayurvedic insight.

INTRODUCTION

Fever is the elevation of body temperature from its normal level. It is a common immunological response to bacterial and viral infections. In fever associated with respiratory symptoms, the pathogens are piled up in the lung tissue and as a mechanism of response, more neutrophils are brought to the host cells which causes the damage to lung epithelium and produces respiratory symptoms. In recent studies, the principal findings like fatigue, dyspnoea, chest pain, and cough were the most prevalent respiratory symptoms found in 52%, 37%, 16%, and 14% respectively of survivors of COVID-19 victims.[1] Which is the most recent pandemic affecting the respiratory system.

In Ayurveda the respiratory symptoms that occur as sequelae of fever are considered as *Jvara Upadrava*. *Jvara* is the concurrent existence of *Swedavarodha*, *Santhapa*, and *Sarvangagrahana.*[2] Due to the *Jvara Santhapa*, *Shoshana* of *Rasadi Dhatu* occurs that produces different types of *Upadrava Vyadhi*. *Swasa* (dyspnoea) *Murcha* (fainting), *Aruchi* (anorexia), *Chardi* (vomiting), *Trishna*(thirst), *Atisara* (diarrhoea), *Vitgraha* (constipation) *Hikka* (hiccough), *Kasa*(cough) *Angabheda* (cramps all over the body) are the *Jvara Upadrava* mentioned in different classical texts.[3] Where *Swasa*, *Kasa*, and *Hikka* are the respiratory symptoms.

Even though the respiratory symptoms are *Vatakaphaja* in origin when it occurs as the *Jvara Upadrava* which shows its own *Samprapthi*, by the influence of *Jvara*. Understanding the pathophysiology of a disease is the initial step in planning the treatment. This is an attempt to find a modified pathophysiology of respiratory symptoms that occur as a complication of *Jvara*.

MATERIALS AND METHODS

Ayurveda classical texts, modern textbooks, research papers, and online sources are used as material for the preparation of this article.

Review of Literature

Respiratory Symptoms as Sequalae

Respiratory problems usually occur in bacterial and viral infections. Human rhinovirus, Human adenovirus, SARS-Cov, Streptococcus pneumoniae, etc are the microorganisms that affect the respiratory system. [4,5] This may affect both the upper and lower respiratory tract. As a result of the invasion of pathological agents, the immune response of the body was activated and manifested as fever. The extreme temperature elevation >41^0 C during fever damages the tissue. At this temperature protein denaturation

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along with inflammatory response occur at cellular levels.[6] It will damage the lungs as well as other organs. When it damages the lung tissues it manifests as respiratory problems.

Defence Mechanism in Respiratory Infections [7]

The local defence in the respiratory pathway is provided by the mucociliary transport mechanism, production of immunoglobin, and phagocytic action of the macrophages. Mucociliary functions are carried out by the ciliated columnar cell and goblet cells of the respiratory epithelium. The cilia of columnar cells sweep away bacteria and viruses. Respiratory mucus secreted by the goblet cell which contains mucin, acts as a trapping agent. The synchronized wave-like motion of the cilia moves these trapped particles toward the back of the throat for expectoration or swallowing. Immunoglobulins, mainly IgA, are secreted by plasma cells. These immunoglobins bind with the antigen from microorganisms. When IgA binds with gram-negative organisms, the enzymatic digestion of mucopolysaccharide occurs.

The microorganism that bypasses the first level of the defence mechanism enters the respiratory tract and colonizes the airways. When colonizing agents are present, the host initiates an immune and inflammatory response. More neutrophils are migrated to the bronchial tube release proteinase enzyme and produce toxic oxygen radicles. Which triggers the additional mucous production and damage of epithelial cells. Lung damage may occur due to persistent inflammation and host cell defence mechanisms. This damage makes respiratory tissues more susceptible to further infection.

Respiratory Symptoms

Cough: Cough is a protective reflex mechanism responsible for mucociliary clearance, and it is a dominant symptom of respiratory disease. The cough mechanism is a simultaneous increase of intrathoracic pressure along with the closure of the glottis. Impaired cough is seen in more serious infections and their sequelae. Based on the duration, cough can be classified into acute, subacute, and chronic. Subacute cough occurs in post-viral tussive syndrome, which persists for 3-8 weeks after the infection. Cough with >8 weeks duration is considered chronic, that can be seen in some inflammatory as well as infectious conditions.[8]

Dyspnoea: Dyspnoea is shortness of breath and is considered as a symptom. The aetiology behind the dyspnoea is different. It may be due to cardiovascular causes, respiratory causes, neuromuscular causes, psychogenic causes, or due to other systemic illnesses.[9] The respiratory causes include asthma, COPD, pneumonia, lung malignancy, etc. Which is characterized by obstruction in expiratory airflow. That leads to dynamic hyperinflation of the lung and chest wall.[10] In diseases affecting the lungs parenchyma is associated with increased stiffness of the lungs and increased work of breathing. In the present scenario, this is a common symptom in a large group of people with a history of fever and respiratory tract infection. That is evident from the existence of dyspnoea as a post-covid syndrome.

Ayurvedic Understanding

Upadrava are major or minor diseases that manifest as complications of the original disease. The *Dosa* involved in the manifestation of the *Upadrava Vyadhi* is the same as that of the main disease, but it shows its own *Samprapti*. For this reason, it is considered as a separate disease entity.[11] The pathological changes resulting from *Jvara Santapa* can produce different types of *Upadrava Vyadhi*. Among the ten *Jvaraupadrava, Kasa*, *Swasa* and *Hikka* are respiratory symptoms that are caused by the *Pranavaha Srothodushti*. The main pathological factor behind this disease is the *Jvara* itself.

Samprapti of a new disease entity can be understood by identifying the *Nidana*, vitiated *Dosha*, *Dhatu*, and *Srotas.*

Involvement of *Dosha Dhatu* and *Srotas*

The involvement of *Dosha* can be understood by analyzing the *Vikalpasamprapti* of disease. *Pitta* is the main *Dosha* in the manifestation of *Jvara Santhapa*, with the *Ushnatwa* of *Pitta* being the dominant factor. Due to this, the *Prakrita Kapha* present in the body liquefies and moves to different parts. *Uras* is the *Pradhana Sthana* of *Kapha Dosha,* and *Hrdaya* as well as *Phuphusa* are located in the *Urapradesha*. Consequently, there is a chance of *Kapha* accumulation in the *Pranavahasrotas*. As the *Santhapa* progresses, the *Rukshatwa* of the body increases, leading to a simultaneous vitiation of *Vata,* which dries the *Kapha* in the *Pranavahasrotas* and produces *Srotorodha*. This *Shoshitha Kapha* obstructs the movement of *Vata,* thus producing respiratory symptoms.

Rasa is the first *Dhatu* developed from the *Ahara Rasa*, which is *Soumya* in nature. The vitiated *Pitta* and *Vata* cause *Soshana* of *Rasa Dhatu.* The simultaneous vitiation of the *Rasa Dhatu* along its *Mala* produces *Pranavahasrotodushti*. The increased *Rukshata* of the body by the *Jvara Santapa* leads to the *Vata Prakopa*. The *Malaroopa Kapha* in the *Pranavahasrotas* obstructs the movement of *Vata* and thereby produces respiratory symptoms.

DISCUSSION

Sequelae are secondary diseases that originate as complications of primary diseases. These groups of diseases mainly result from the pathophysiological

changes that occur during the body's defence mechanisms. According to modern science, the normalization of lung tissue following a viral infection is a slow process. Even after the symptomatic recovery, a persistent cough may last for two or three months, reflecting the ongoing healing of the bronchi. This provides further evidence to support the concept of *Upadrava Vyadhi* described in Ayurvedic literature.

Swasa Kasa and *Hikka* are the main respiratory problems that originate due to the vitiation of *Pranavahasrotas.* All these diseases originate from *Amasaya*, and the *Dosha* involved in the manifestation of these diseases are generally *Kapha* and *Vata*. However, when *Swasa*, *Kasa*, and *Hikka* occur as *Upadrava* of *Jvara* they present different *Samprapti*.

As the fever progresses, it leads to the drying up of *Kapha* due to the *Ruksha* and *Ushna* properties of *Vata* and *Pitta*. This results in the adherence of the *Soshita Kapha* to the respiratory channels, obstructing the normal movement of *Vata* in the *Pranavahasrotas*. Consequently, the body attempts to expel these impurities, leading to the development of *Kasa*, which sometimes manifests as *Hikka*. If the *Dhatusoshana* progresses or if *Kasa* is neglected, it can lead to *Swasa*.

The dominating *Dosha* in disease and the *Prakriti* play a role in producing respiratory problems. If the person has *Vata-Pitta Prakriti* and the *Jvara* is *Vata-Paitika*, it promotes the *Shoshana* of *Kapha*. All the *Dosha* has a significant role in the pathophysiology of respiratory symptoms that occur as sequelae of fever.

CONCLUSION

The *Upadrava Vyadhi* is produced as a complication of the main disease. *Jvara Upadrava* is a group of diseases that occur as a complication of *Jvara*. In modern science, they are known as sequelae of fever. Cough, dyspnea, and wheezing are the respiratory symptoms of fever associated with viral and bacterial infections. The same evidence can be seen in the Ayurveda classical text, where *Swasa*, *Kasa,* and *Hikka* are the respiratory symptoms mentioned under the *Jvara Upadrava.* When these respiratory symptoms arise as sequelae of fever, they are directly associated with *Jvara Samprapti*. In this state, the vitiation of *Pranavaha Srothas* is influenced by the bodily changes caused by the progression of the primary *Vyadhi*, the pre-existing *Khavaigunya* and the imbalance of the *Dosha*.

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