

A CONCEPTUAL STUDY OF PRANAHA SROTODUSHTI DUE TO AIR POLLUTION W.S.R. TO RAJ & DHOOM

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ABSTRACT

Raj (Dust particle), *Dhoom* is a minute particles present in the environment. Often the-separticles are too small to be seen but, because they are airborne, they can be breathed in through the nose and mouth. There is a higher risk of developing *Pranavaaha Srotodushti* (Vitiation of air flowing channels) in individuals who are exposed to *Raj* because of their occupation in these areas. All the *Nidana* described in reference of *Shvasa Roga* can be considering *Nidana* of *PranavaahaSrotodushti*. Majority of urban India is affected with dust particles. It is frequently seen in all ages that are exposed to dust particles. In recent years miscellaneous group of diseases are emerges as a major life threatening problem which were not so prominent in past, *PranavaahaSrotodushti* (Respiratory Diseases) one of them.

Keywords: *Raj, Dhoom, Nidana, PranavaahaSrotodushti.*

INTRODUCTION

Air pollution is the introduction of chemicals, particulate matter or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere. The main air pollutants are represented by gases forms, particles in suspension, different ionizing radiation and noise. The gases forms are: oxidized and reduced forms of carbon (CO₂, CO), of nitrogen (NO₂, NO), SO₂, O₃etc. The particulate forms are PM10 & PM2.5 particulate matter, heavy metals with toxic effect (Pb, Cd, As), polycyclic aromatic hydrocarbons etc. The air pollutants factors can be chemicals, mechanics, physical and acoustic. Most of the sources of air pollution are related to

man's activities as a result of the modern lifestyle. Principal pollution sources include chemical plants, industry automobiles, coal-fired power plants, oil refineries, petrochemical plants, nuclear waste disposal activity, incinerators, plastics factories, and other heavy industry. Agricultural air pollution comes from spraying of pesticides and herbicides. Harmful effects of pollution have both acute and chronic effects on human health. Health effects range anywhere from minor irritation of eyes and the upper respiratory system to chronic respiratory disease, heart disease, lung cancer, and death. Air pollution can affect the quality of the air we breathe, the water and even the rain that we are experiencing. The Greenhouse Ef-

fect also referred to as global warming. Ozone depletion is another result of pollution.¹

Air Quality Index (AQI)²

The Air Quality Index (AQI) is a standardized indicator of the air quality in a given location. It measures mainly

ground-level ozone & particulates (except the pollen count), but may also include SO₂& NO₂. Various agencies around the world measure such indices, though definitions may change between places.

Table No. 1

S.No	AQI Category (Range)	SO ₂ (24-hr avg.) (µg/m ³)	NO ₂ (24-hr avg.) (µg/m ³)	PM _{2.5} (24-hr avg.) (µg/m ³)	CO (8-hr avg.) (mg/m ³)	O ₃ (8-hr avg.) (µg/m ³)	PM ₁₀ (24-hr avg.) (µg/m ³)
1.	Good (0-50)	0-40	0-40	0-30	0-1.0	0-50	0-50
2.	Satisfactory(51-100)	41-80	41-80	31-60	1.1-2.0	51-100	51-100
3.	Moderate (101-200)	81-380	81-180	61-90	2.1-10	101-168	101-250
4.	Poor (201-300)	381-800	181-280	91-120	10-17	169-208	251-350
5.	Very poor (301-400)	801-1600	281-400	121-250	17-34	209-748	351-430
6.	Severe (401-500)	>1600	>400	>250	>34	>748	>430

Table No. 2

IND-AQI	Associated Health Impacts
Good (0-50)	Minimal Impact
Satisfactory(51-100)	May cause minor breathing discomfort to sensitive people
Moderate (101-200)	May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
Poor (201-300)	May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart disease
Very Poor (301-400)	May cause respiratory illness to the people on prolonged exposure. Effect may more pronounced in people with lung and heart diseases
Severe (401-500)	May cause respiratory effects even on healthy people and serious health impacts on people with lung/heart diseases. The health impacts may be experienced even during light physical activity

Detailed description of two major air pollutant –

- 1) *Raj* (Suspended Particulate Matter)
- 2) *Dhoom* (Smoke)
- 1) ***Raj* (Suspended Particulate Matter)³**
For the first time, U. S. Environmental Protection Agency (EPA) has promulgated primary and secondary national

ambient air quality standards (NAAQS) for six criteria pollutants: SO₂, NO_x, CO, O₃, PM₁₀/PM_{2.5}, and Pb. Primary pollutant are health-related and secondary pollutants are welfare-related. In India, Central Pollution Control Board (CPCB) has accepted the same definition with little bit

change, in National Air Quality Monitoring Program. Suspended particulate matter (SPM) in air generally is considered to be all airborne solid and low vapor pressure liquid particles. Suspended particulate matter in ambient air is a complex, multi-phase system consisting of a spectrum of aerodynamic particle sizes ranging from below 0.01 μm to 100 μm and larger.

Respirable particles are attributed to growth of particles from the gas phase and subsequent agglomeration; most coarse particle (sizes 2.5-10 μm) is made of mechanically abraded or ground particles. Particles that have grown from the gas phase, either because of condensation, transformation, or combustion, occur initially as very fine nuclei (0.05 μm). These particles tend to grow rapidly to accumulation mode particles around 0.5 μm which

are relatively stable in the air. Coarse particles, on the other hand, are mainly produced by mechanical forces, such as crushing and abrasion. These coarse particles therefore normally consist of finely divided minerals, soil, or dust that result from entrainment by the motion of air or from other mechanical action within their area. Since the mass of these particles is normally $>3 \mu\text{m}$, their retention time in the air parcel is shorter than that of the fine particle fraction. These smaller particles penetrate deeply into the lung, where the potential for health effects is the greatest. In addition, the smaller particles typically are man-made. TSP typically has a bimodal distribution, with naturally occurring particles centered at about 10 μm & man-made particles centered at about 0.4 μm .

Table No. 3

Fraction	Size range
SPM (Suspended Particulate Matter)	All air born solid & Low vapor pressure liquid particle ranging from below 0.01 μm to 100 μm &larger
PM (Particulate Matter)	No preference to size selection
TPM (Total Particulate Matter)	< 100 μm
PM10 (thoracic fraction)	10 μm
PM2.5 Respirable Suspended Particulate Material (RSPM)	2.5 μm
PM1	1 μm
Ultra-fine (UFP or UP)	0.1 μm
PM10-PM2.5 (coarse fraction)	2.5 μm - 10 μm

Hazards of Raj⁴ -

A dust within range of 0.5 to 3 micron is a health hazard producing, after a variable period of exposure, a lung disease known as pneumoconiosis, which may gradually cripple a man by reducing his working capacity due to lung fibrosis and other complications. The hazardous effects of dust of lung depend upon a number of

factors such as (a) chemical composition (b) fineness (c) concentration of dust in the air (d) period of exposure and (e) health status of the person exposed. Therefore, the threshold limit values for different dust are different. In addition to the toxic effect of the dust on the lung tissues, super imposition of infection like tuberculosis may

also influence the pattern of pneumoconiosis. The important dust diseases are –

- i) **Inorganic Dust Diseases**
- a) Coal dust: Anthracosis
 - b) Silica : Silicosis
 - c) Asbestos : Asbestosis, cancer lung
 - d) Iron : Siderosis
- ii) **Organic (vegetable) Dust Diseases**
- a) Cane fiber : Bagassosis
 - b) Cotton dust : Byssinosis
 - c) Tobacco : Tobacosis
 - d) Hay or grain dust :

Farmers' lung

2) Dhoom (Smoke)⁵

Smoke is the collection of airborne solid and liquid particulates and gases emitted when a material undergoes combustion or pyrolysis, together with the quantity of air that is entrained or otherwise mixed into the mass. It is commonly an unwanted by-product of fires (including stoves, candles, oil lamps, and fireplaces), but may also be used for pest control (cf. fumigation), communication (smoke signals), defense (smoke-screen) or smoking (tobacco, marijuana, crack, etc.). Smoke is used in rituals, when incense, sage, or resins are burned to produce a smell for spiritual purposes. Smoke is sometimes used as a flavoring agent and preservative for various foodstuffs. Smoke is also sometimes a component of internal combustion engine exhaust gas, particularly diesel exhaust. Smoke inhalation is the primary cause of death in victims of indoor fires. The smoke kills by a combination of thermal damage, poisoning and pulmonary irritation caused by carbon monoxide, hydrogen cyanide other combustion product. Smoke particles are an aerosol (or mist) of solid particles and liquid droplets that are close to the ideal range of sizes for Mie scattering of visible light.

Etiological factors affecting Pranavaha-Srotasa

Raj (dust), Dhoom (smoke), ShitaSthana (cold environment), Shita Ambu Sevana (drinking cold water), and Ati-Vyayama (exercise) etc.⁶Raj is one of the prime factors which cause the vitiation of Srotasa. Raj is considered as Dhuli.⁷Dhuli indicate minute particles which are visible or may not visible to our naked eyes. Which enters through mouth and nose develops diseases such as Kasa, Hikka, Shvasa, Pratishtaya. Dust particle has various classifications according to size, shape and different origin. The dust particle hamper's the breathing pattern when it is excessively inhaled. Dust and smoke particles add friction to the air flow during breathing. Particles larger than 30-50µm in size tend to not to be inhaled through the nose whereas particulates on the order of 5- 10µm impact on the nasopharynx and enter the conducting airway.⁸

Dust particle is most commonly inhaled by individual. Exposure to more dust particles for longer duration increases the risk for health problem in respiratory tract system. The diseases due to dust particles is commonly seen in developing countries because of improper guidance, no preventive measures, lack of amenities, improper road and many more. The coating of dust, pollen grains etc. which comes under Raj causes Shvasa, Kasa etc. which are due to Pranavaha Srotodushti.^{9,10}

Pranavaha Srotasa Mula

Mula refers to developmental or generative place Pranavaha Srotasa have Hridaya (Heart), Mahasrotasa and Rasavahinidhamani added by Susruta as originative places technically any organ takes in and sends out is Hridaya – either Heart or Lung.¹¹

Pranavaha Srotodushti Lakshana¹²

In Ayurvedic Text Symptoms of *PranavahaSrotodushti* is described in very short. *PranavahaSrotodushti* are a group of symptoms which show the clinical presentation of Respiratory problems.

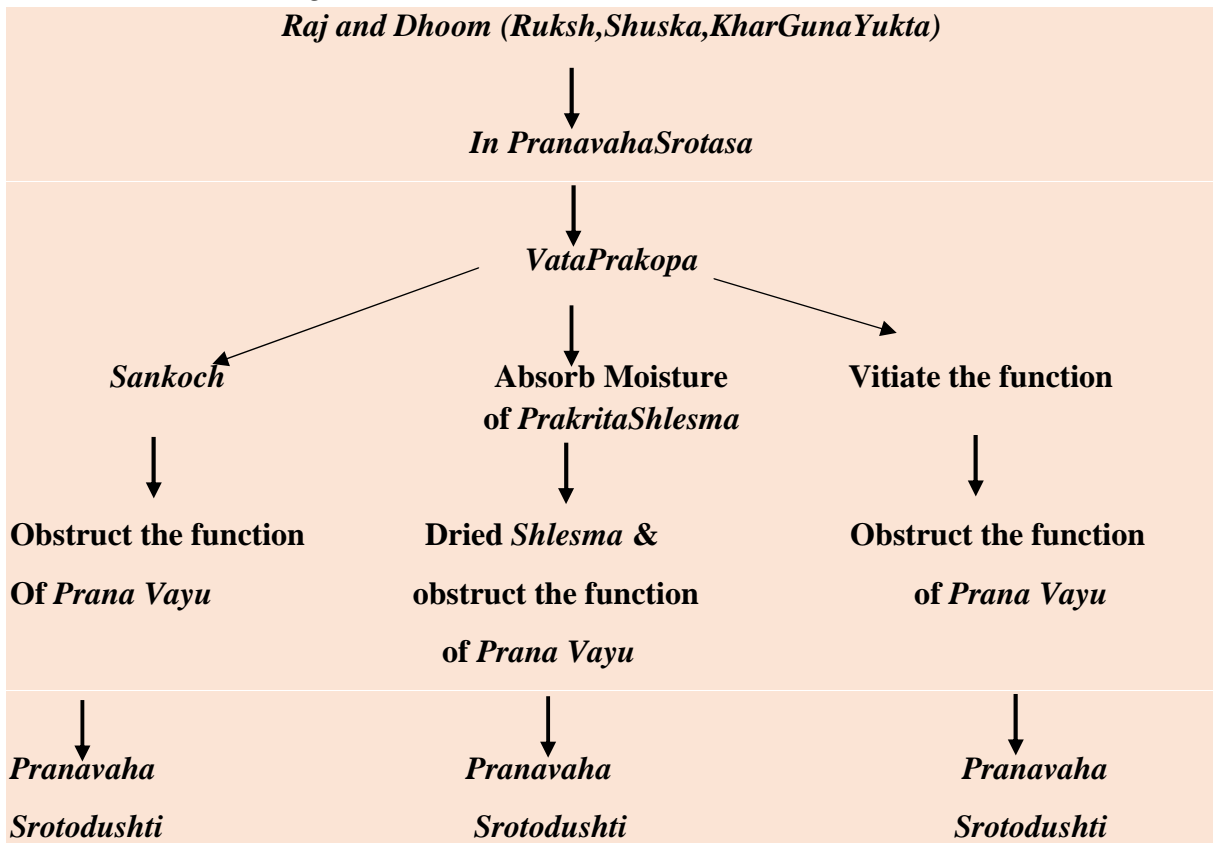
- *Atisrustam*(too long respiration)
- *Atibaddham*(restricted respiration)
- *Kupitam*(agitated respiration)
- *Alpalpam* (shallow / short respiration)
- *Abhikshanam*(frequent/ increased/ repeated respiration)
- *Sashabdam* (stertrous respiration)
- *Sashoola* (painful respiration)

Then we see that, these all *Lakshana* are related with *ShvasaRoga*. Even the treat-

ment of *PranavahaSrotodushti* is also indicated to follow the same treatment of *ShvasaRoga*.¹³ On the basis of these reasons it may be assumed that— all the causes or *Nidana* described in reference to *ShvasaRoga* can be considered as *Nidanas* of *PranavahaSrotodushti*.

Samprapti (Pathogenesis)

Raj and *Dhoom* are mainly *Ruksha*, *Shuska* and *KharGunaYukta* so after interfering in the *PranavahaSrotasa*, they vitiated *VataDosh*. And this vitiated *VataDosh* may produce *PranavahaSrotodushti* by method described below-



DISCUSSION

Ayurveda is science of life, which deals with every aspects of life. Prevention & management of diseases are vividly described in *Ayurvedic* text. Various etiological factor related to diseases have been mentioned. The classification of causative factor is so broad & scientific that it even

includes major problem of present era also. *Vayu Dushti* (Air Pollution) is one such factor which is creating a continuous threat today on health. It is mentioned in *Charaka Samhita Vimana Sthana* in *Janpadodhvansa Adhyaya*. As *Acharya Charaka* has mentioned that – “vitiating *Vayu* would be unhealthy.”

It is very similar to the modern definition of Air Pollution as – “Presence of any material that imbalance the natural air and has an adverse effect on human, plants, animals and its resources are considered Air pollution.”

The components of Air Pollution described by Acharya Charaka(Ch. Vi. 3/6-1)are – Air Pollution is only a small part of Vayu Dushti as -Unusual change in the properties of seasonal air, Stagnant air, Fast moving air, Un-Cutaneous air, Excessive cold air, Excessive hot air, Excessive humid air, Excessive sound producing air, Excessive velocity of air from every direction, Excessive whirlwind air, Bad odor, Excessive humidity, Sand particle, Dust, Smoke are the properties of Anarogyakara Vayu.

According to modern concept, all properties of Vayu Dushti mentioned above are not incorporated under Air Pollution. Polluted air is very harmful for human, animal, plants and its resources. That is why Acharya Charaka has considered vitiated Vayu under Anarogyakar Vayu (Polluted Air).

Modern science has made so many advancements and we precisely know that Bad odor are produces by which gases, what % of humidity should consider as excessive humidity, which kinds of problems may be created by Sand particle, what's material comes under Dust & Smoke and what kinds of diseases can be produced by them.

As we know, most of all diseases produced by Air Pollution are of Respiratory system and the Respiratory system is considered closely equivalent to PranavahaSrotasa. In PranavahaSrotasa, Prana word is used for “Prana Vayu”. It means the place where Prana Vayu abode & move should consider as PranavahaSrotasa. On the basis of this, most of Acha-

ryas consider PranavahaSrotasa, equivalent to Respiratory system. It also seems right in reference to diseases, which are consider in PranavahaSrotasa are the same diseases which are consider in Respiratory diseases.

In the reference of “Pranayatan”, Prana word is used for ‘Life’ & ‘Ayatan’ means habitat. It means the places where life dwell specially consider as “Pranayatan”.

Most of all diseases produced by Air Pollution are of Respiratory System. And the Respiratory System is the System which consider equivalent to PranavahaSrotasa. In classical text the description of Air pollution due to natural resources, as –wind born dust and smoke from wildfire etc. but in Present era due to modern Civilization, urbanization and industrialization anthropogenic (man-made) sources era becoming most responsible for the Air pollution. Transport, Power Plants, Oil Refining, Burning Crop Waste, Fumes from Paints, Varnish Spray nuclear Weapons, Toxic gases are main anthropogenic sources responsible for Air pollution.

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