

EFFECT OF AIR POLLUTION ON LUNGS

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Article Info

Article Received: 21 January 2024

Article Revised: 11 February 2024

Published on: 01 March 2024



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ABSTRACT

Air pollution consists of harmful or poisonous substances in outdoor or indoor air. it is a major risk factor for the respiratory system. It is harmful to people even if they don't have lung disease but it is particularly dangerous for those living with asthma, COPD, and other respiratory ailments. It affects the normal physiology of the respiratory system.

In the modern aspect, there are some volumetric parameters for healthy lungs.

- Tidal volume (TV) – the volume of air inspired/expired by an individual per respiratory excursion at rest -500ml
- Inspiratory reserve volume (IRV) - 2000-3000ml
- Expiratory reserve volume (ERV) - 1000ml
- Residual volume (RV)- after even the severest expiratory effort the lungs still contain some air called residual volume - 1500ml

KEYWORDS: Pollution, *Ayurveda*, lungs.

INTRODUCTION

In Ayurveda, the physiology of respiration as described by *Acharya Sharangdhar* is:

“नाभिश्च:

प्राणपवनः स्पृष्ट्वा हत कमलान्तरं, कंठद बहिविर्न्याति पातुः वि
ष्णुपदामृतं ।

पित्वाचाम्बरपीयूष पुनरायाती वेगवत प्रीणयन देहमखिलं जीव्यंजठ
रानलं” ॥ (शा.)

The *Pranavayu* living in the *Nabhi* (between the *Pakwashaya* and the *Aamashaya*), touching the inner part of the heart, comes out of the gullet or respiratory tract to drink the nectar of *Vishnupad* (*Akasha*) and after drinking the nectar of the sky (*Pranavayu*) soon then it enters the body.

In this way, keeping the whole body satisfied and happy throughout life, it keeps on illuminating the *Jatharagni*.

What Is Air Pollution?

Air pollution is the contamination of air due to the presence of substances in the atmosphere that are harmful to the health of humans and other living beings, or cause damage to the climate or to

materials. There are many different types of air pollutants, such as gases, particulates, and biological molecules.

Two common types of air pollutants that can reach unhealthy levels and affect lung health:

- Ground-level ozone Smog: is formed by a chemical reaction between volatile organic compounds (VOCs) and nitrogen oxides (NO_x) in the presence of sunlight. VOCs are organic compounds that easily become vapours or gases, such as engine exhaust. NO_x gases are produced from the reaction among nitrogen and oxygen during combustion. One of the largest producers of NO_x gases is vehicle engine fuel combustion.

Ozone concentrations can reach unhealthy levels when the weather is hot and sunny with little or no wind. Unlike upper atmosphere ozone, which occurs naturally and is beneficial because of its protective qualities, ground-level ozone is a manmade air pollutant that can have harmful effects on both humans and the environment. Daily ozone levels are typically highest in the evening and lowest around sunrise.

- Fine particulate matter, called **Soot**: refers to tiny particles or droplets in the air (nearly invisible to the naked eye), usually a by-product of combustion, such as auto and diesel exhaust, power plant emissions, or wood smoke.

Soot can reach high levels under the same weather conditions as smog. It can also occur at any time of the year when dry, calm, and clear conditions can allow particle pollution to concentrate. Soot reduces visibility and causes the air to appear hazy when levels are elevated.

- Other sources of air pollution include sources of smoke, including cigarette smoke, burning fuel in houses for heating or cooking, emissions from power generation, industry, farming, etc.

Events that include bonfires and firework displays, such as bonfire night and *Diwali*, can result in temporary rises in pollution. Some people are also exposed to air pollution through their jobs. Heating, cooking, candles, and incense are also sources of smoke and particles.

How Does Air Pollution Affect the Lungs?

Breathing in dirty air brings air pollutants deep into our lungs which irritates our airways and may cause shortness of breath, coughing, wheezing, *Asthma* episodes, and chest pain.

Air pollution exposure can trigger new cases of asthma, exacerbate (worsen) a previously-existing respiratory illness, and provoke the development or progression of chronic illnesses including lung cancer, chronic obstructive pulmonary disease, and emphysema. Air pollutants also negatively and significantly harm lung development, creating an additional risk factor for developing lung diseases later in life.

Effect of Air Pollutants on Lungs

- Pollutants like small dust particles cause airway irritation.
- It induces oxidative stress and consequently pulmonary & Systemic inflammation.
- Chronic exposure causes bronchial remodelling & COPD.
- Gases like O₃, NO₂, SO₂ are extremely irritating. It induces respiratory tract inflammation. Exposure For a long time can damage the epithelium lining of the airway, which results in inflammation and airway obstruction.
- Pollutants increase bronchial reactivity and increase susceptibility to infection and allergens, which results in Bronchoconstriction.
- Carbon mono-oxide (co) binds to haemoglobin interfering with with oxygen transport.

- Inhalation of pollutants leads to the narrowing of alveoli which causes shortness of breathing.
- Pollutants can be carcinogenic.

Major effects of chronic exposure to pollutants

- Increased mortality due to respiratory disease.
- Increased incidence and prevalence of asthma & COPD.
- Increased incidence of Lung cancer.
- Chronic changes in pulmonary function.
- Reduction in FEV and FVC.
- Impaired lung development in children.

Major Respiratory Disorders Due to Air Pollution

- **Asthma:** *Asthma*, a chronic disease of the lungs characterized by inflammation and narrowing of the airways, causes a sensation of tightness in the chest, shortness of breath, wheezing, and coughing. If untreated, asthma episodes can be near-fatal or even fatal. *Asthma* is not currently curable, and damage that is done to lung tissue during asthma attacks may lead to permanent damage. There are many triggers to asthma attacks, including dust, smoke, pollen, and volatile organic compounds. Common outdoor pollutant triggers include ozone, carbon monoxide, sulphur dioxide, and nitrogen oxides.

- **The Asthma-Ozone Connection:** Ozone is one of the most widespread air pollutants. It is formed when volatile organic compounds react with nitrogen oxides in the presence of sunlight. Ozone irritates the lungs at concentrations that are fairly common in urban settings, particularly in the summer months. Increases in ozone are linked to *Asthma* and other lung diseases. For those with severe *Asthma*, symptoms increase even when ambient ozone levels fall under the thresholds set by the EPA. Elevated ozone levels also aggravate pre-existing heart problems, like *Angina*.

Chronic Obstructive Pulmonary Disease (COPD), Chronic Bronchitis, and Emphysema

Chronic Obstructive Pulmonary Disease (COPD) is another condition characterized by the narrowing of the airways, but these changes are permanent rather than reversible. COPD is caused by exposure to pollutants that produce inflammation, an immunological response. In larger airways, the inflammatory response is referred to as chronic bronchitis. In the tiny air cells at the end of the lung's smallest passageways, it leads to the destruction of tissue, or emphysema. Although current and ex-smokers account for most patients with COPD, exposure to air pollutants plays an important role in the development of COPD and the origin and development of acute exacerbation.

- **Lung Cancer:** Lung cancer, the leading cancer killer in both men and women, is often (and accurately) associated with smoking tobacco. While that's true, there are multiple other risk factors for developing lung cancer, including air pollution. Particulate matter and ozone in particular may affect mortality due to lung cancer.

- **Silicosis:** Silicosis is a long-term lung disease caused by inhaling large amounts of crystalline silica dust, usually over many years. Silica is a substance naturally found in certain types of stone, rock, sand, and clay. Working with these materials can create very fine dust that can be easily inhaled.

Air pollution is a danger to lung health, particularly for

- Babies and children, whose normal breathing is faster than older children and adults.
- The elderly, who may have higher respiratory rates.
- People who work or spend more time in outdoors.
- People with heart or lung diseases.
- Air pollution is especially harmful to people who are living with a lung condition, such as asthma or chronic obstructive pulmonary disease (COPD).
- Older people, children and babies also have a higher risk of experiencing symptoms and other harmful effects from breathing in polluted air.
- Healthy people who work or exercise outdoors might also experience symptoms when they're exposed to moderate or high levels of pollution. They may feel out of breath or start coughing.

MATERIAL AND METHODS

Several Ayurvedic classic literature and modern literature are used to investigate this issue. Material on pollution and lungs, its quality, functions, its significance, and other pertinent issues were gathered, investigated, and argued to gain a thorough understanding of the idea of air pollution and lung capacity.

REVIEW OF LITERATURE

Acharya Sharangdhar describes the concept of exchanges of gases through the lungs.

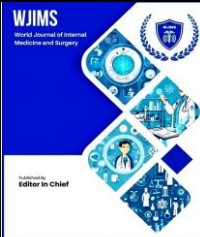
CONCLUSION

- The effect that air pollution has on your lungs depends on the type and mix of pollutants in the air, the concentration of pollutants, and how much of the pollutant gets down into your lungs.
- If you're exposed to high pollution levels, for example on a busy road or during a high pollution episode, you may experience a rapid onset of symptoms. These include irritated airways, feeling out of breath, and coughing. If you find these symptoms happen regularly you should visit your doctor for a review.

- If you have a lung condition, high levels of pollution can also cause an exacerbation of your symptoms, such as an asthma attack or a COPD flare-up. People with asthma may notice they need to use their reliever inhaler more than normal when pollution is high. It's also very important you take your preventer inhaler regularly.

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