



Review Article

Impact of Air Pollution on ENT Health: An Ayurvedic Perspective on *Pratishyaya* and *Shiro Roga* — A Critical Review

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Abstract (245 words)

Air pollution has become one of the most significant environmental determinants affecting human health. Continuous exposure to particulate matter, nitrogen oxides, sulfur dioxide, ozone, and chemical pollutants contributes to increasing incidence of upper respiratory tract disorders and ENT-related morbidity. The nasal cavity, paranasal sinuses, pharynx, and laryngeal structures act as the primary interface between inhaled pollutants and the human body, making them highly vulnerable to environmental insults. Modern research demonstrates that air pollutants induce mucosal irritation, oxidative stress, chronic inflammation, impaired mucociliary clearance, and immune dysregulation, leading to allergic rhinitis, chronic rhinosinusitis, pharyngitis,

and headache disorders. Ayurveda describes similar pathological processes through the concepts of *Pratishyaya*, *Shiro Roga*, *Kapha-Vata Dushti*, and impairment of *Pranavaha* and *Urdhvajatrugata Srotas*. Classical texts explain that disturbance of normal *Dosha* function and accumulation of pathological factors result in obstruction of channels and manifestation of disease. This review critically evaluates the relationship between air pollution and ENT disorders from both modern and Ayurvedic perspectives. Classical Ayurvedic literature and

recent scientific publications from PubMed, Scopus, and Web of Science were reviewed. The analysis suggests that pollutant-induced inflammation may be correlated with *Kapha aggravation*, *Ama formation*, and *Srotodushti*. Ayurvedic interventions including *Nasya Karma*, *Kavala/Gandusha*, dietary regulation, and *Rasayana* therapy may provide preventive and supportive approaches for pollution-associated ENT disorders. Further clinical and molecular research is required to validate integrative strategies.

Keywords

Air pollution, ENT disorders, *Pratishyaya*, *Shiro Roga*, *Nasya*, Ayurveda, respiratory health

1. Introduction

Air pollution represents a major global environmental health challenge. Rapid industrialization, vehicular emissions, construction activities, and urban lifestyle changes have significantly increased exposure to airborne pollutants [1].

The respiratory tract and upper airway structures are the first biological barriers against inhaled pollutants. The nose, paranasal sinuses, pharynx, and larynx continuously interact with external environmental agents and therefore become highly susceptible to inflammatory and degenerative changes [2].

Major air pollutants include:

- Particulate matter (PM2.5 and PM10)
- Nitrogen dioxide (NO₂)
- Sulfur dioxide (SO₂)
- Ozone (O₃)
- Volatile organic compounds [3]

These pollutants are associated with:

- Allergic rhinitis
- Chronic sinusitis
- Throat irritation
- Voice disorders
- Headache
- Exacerbation of asthma [4]

Ayurveda considers the region above the clavicle (*Urdhvajatru*) as a specialized area governed by specific physiological mechanisms. Disorders affecting the nasal cavity and head are described under *Pratishyaya* and *Shiro Roga* [5].

The nasal pathway is considered an important route of *Prana* exchange, and impairment of this pathway disturbs the balance of *Dosha*, especially *Kapha* and *Vata* [6].

In the era of increasing pollution, understanding ENT disorders through Ayurvedic principles provides a holistic approach towards prevention and management.

Aim

To critically analyze the impact of air pollution on ENT health and explore its correlation with Ayurvedic concepts of *Pratishyaya* and *Shiro Roga*.

Objectives

1. To review the effects of air pollution on ENT health.
2. To analyze classical concepts of *Pratishyaya* and *Shiro Roga*.
3. To correlate pollution-induced pathology with Ayurvedic principles.
4. To evaluate preventive and therapeutic Ayurvedic approaches.

2. Methodology of Literature Review

A narrative review was conducted using classical Ayurvedic texts and modern scientific literature.

Classical Sources

Reviewed:

- Charaka Samhita
- Sushruta Samhita
- Ashtanga Hridaya
- Madhava Nidana
- Bhava Prakasha

Modern Databases

Searched:

- PubMed
- Scopus
- Web of Science
- Google Scholar

Keywords

“Air pollution ENT disorders”

“Particulate matter rhinitis”

“Pratishyaya Ayurveda”

“Shiro Roga”

“Nasya therapy”

Inclusion Criteria

- Human studies on air pollution and ENT health
- Classical Ayurveda references
- Clinical and experimental studies
- Review articles

Exclusion Criteria

- Non-ENT pollution effects
- Animal studies without clinical relevance
- Non-scientific publications

3. Conceptual Background of *Pratishyaya*

Pratishyaya is one of the important disorders described under nasal diseases (*Nasa Roga*).

According to Ayurveda, it occurs due to vitiation of:

- Vata
- Kapha
- Pitta [7]

The disease involves:

- Nasal obstruction
- Excessive nasal discharge
- Sneezing
- Altered smell sensation

Types of *Pratishyaya*

Classically described types include:

1. Vataja *Pratishyaya*
2. Pittaja *Pratishyaya*
3. Kaphaja *Pratishyaya*
4. Sannipataja *Pratishyaya*
5. Raktaja *Pratishyaya* [8]

4. Concept of *Shiro Roga*

The head (*Shiras*) is considered a vital organ because it contains important sensory and neurological structures.

Ayurveda describes several diseases affecting the head region including:

- Headache disorders
- Sinus-related disorders
- Sensory disturbances [9]

Shiro Roga may develop due to:

- Dosha imbalance
- Environmental exposure
- Improper lifestyle

5. Air Pollution and ENT Health

5.1 Nasal Effects

Air pollutants affect nasal mucosa by:

- Increasing inflammatory mediators
- Damaging epithelial cells
- Reducing mucociliary clearance [10]

Clinical outcomes:

- Allergic rhinitis
- Nasal blockage
- Sneezing
- Excess discharge

5.2 Sinus Effects

Pollutants contribute to:

- Chronic rhinosinusitis
- Sinus inflammation
- Reduced drainage [11]

5.3 Throat and Laryngeal Effects

Pollution exposure may cause:

- Throat irritation
- Chronic cough
- Voice changes [12]

5.4 Headache and Neurological Effects

Exposure to particulate matter is associated with:

- Increased headache frequency
- Neuroinflammation
- Oxidative stress [13]

6. Ayurvedic Correlation of Air Pollution-Induced ENT Disorders

Environmental pollutants may be understood as external causative factors (*Bahya Nidana*).

They may cause:

Kapha Dushti

Manifesting as:

- Excess mucus
- Congestion
- Heaviness

Vata Dushti

Manifesting as:

- Dryness
- Irritation
- Pain
- Headache

Ama Formation

Pollutants disturb metabolism leading to:

- Chronic inflammation
- Reduced immunity

Srotodushti

Pollutants obstruct normal flow of channels producing disease.

7. Pathophysiological Correlation Between Air Pollution and ENT Disorders

Air pollutants exert their effects mainly through direct irritation, inflammatory activation, oxidative stress, and immune modulation.

7.1 Modern Mechanism

Inhaled pollutants interact with nasal and respiratory epithelium causing:

1. Oxidative Stress

Particulate matter generates reactive oxygen species (ROS), which damage epithelial cells and activate inflammatory pathways [14].

Effects include:

- Mucosal edema
- Increased mucus secretion
- Tissue irritation

2. Chronic Inflammation

Pollutants stimulate inflammatory mediators such as:

- IL-6
- IL-8
- TNF- α

leading to persistent mucosal inflammation [15].

3. Impaired Mucociliary Clearance

The nasal mucosa normally removes trapped particles through ciliary movement.

Pollutants decrease:

- Ciliary activity
- Mucosal defense

resulting in infection susceptibility [16].

7.2 Ayurvedic Interpretation

The same process may be interpreted through:

Dosha Prakopa

Repeated exposure to polluted air may aggravate:

- Kapha → excessive secretions, congestion
- Vata → dryness, irritation, pain

Srotodushti

Pollutants disturb normal movement of *Prana Vayu* in *Pranavaha Srotas* and affect *Urdhvajatru Srotas*.

Agni Dushti

Chronic exposure may impair systemic metabolism resulting in accumulation of *Ama*.

8. Association Between *Pratishyaya* and Modern ENT Disorders

Ayurvedic Condition	Modern Correlation
<i>Kaphaja Pratishyaya</i>	Allergic rhinitis, chronic rhinitis
<i>Vataja Pratishyaya</i>	Dry rhinitis, mucosal irritation
<i>Pittaja Pratishyaya</i>	Inflammatory rhinitis
<i>Sannipataja Pratishyaya</i>	Chronic mixed ENT disorders
<i>Shiro Shoola</i>	Headache/migraine
<i>Shiro Gaurava</i>	Sinus pressure

9. Modern Management of Pollution-Related ENT Disorders

Management includes:

9.1 Allergen and Pollution Avoidance

Measures:

- Use of protective masks
- Indoor air purification
- Avoidance of peak pollution exposure

9.2 Pharmacological Treatment

Allergic Rhinitis

Intranasal corticosteroids

Example:

Fluticasone propionate nasal spray

Dose:

Adults:

2 sprays/nostril once daily

Children:

1 spray/nostril once daily (age dependent)

Duration:

4–8 weeks depending on severity

Action:

- Reduces nasal inflammation

Antihistamines

Example:

Cetirizine

Dose:

Children 6–11 years:

5–10 mg once daily

Adults:

10 mg once daily

Duration:

5–14 days according to symptoms

Action:

- Reduces sneezing
- Decreases itching and discharge

Saline Nasal Irrigation

Normal saline:

0.9% solution

Frequency:

1–2 times daily

Action:

- Improves mucociliary clearance

10. Ayurvedic Management

Ayurveda emphasizes:

1. Elimination of aggravated Dosha
2. Restoration of mucosal health
3. Improvement of immunity

Treatment includes:

- Nasya Karma
- Kavala/Gandusha
- Dhumapana
- Rasayana
- Dietary correction

10.1 Nasya Karma

Nasa hi Shiraso Dwaram

The nose is considered the gateway to the head region [17].

Nasya helps in:

- Maintaining nasal mucosal health
- Removing accumulated Dosha
- Improving sensory functions

A. Anu Taila Nasya

Ingredients

Classical oil containing:

- Dashamoola
- Yashtimadhu
- Devadaru
- Shatavari
- Jivanti etc.

Dose

Pratimarsha Nasya:

2 drops in each nostril

Frequency:

Daily

Duration:

Long-term preventive use

Action

- Balances Vata-Kapha
- Lubricates nasal mucosa
- Supports respiratory defense

B. Shadbindu Taila Nasya

Indicated in:

- Chronic rhinitis
- Sinus congestion
- Head heaviness

Dose

2–6 drops per nostril

Frequency:

Daily or as advised

Duration:

7–14 days therapeutic course

Action

- Reduces congestion
- Improves sinus drainage

10.2 Kavala and Gandusha

Oil pulling supports oral and upper airway hygiene.

Tila Taila Gandusha

Dose:

10–15 ml

Duration:

5–10 minutes

Frequency:

Daily

Benefits:

- Reduces dryness
- Improves oral mucosal health

Triphala Kwatha Gandusha

Preparation:

5 g Triphala boiled in 100 ml water

Dose:

30–50 ml

Duration:

2–5 minutes

Action:

- Anti-inflammatory
- Antimicrobial

10.3 Dhumapana (Classical Context)

Medicated smoke inhalation is described for specific *Kapha* disorders.

Used cautiously.

Possible drugs:

- Haridra
- Guggulu
- Agarū

Purpose:

- Reduces excessive secretions
- Clears respiratory channels

(Should not be used in acute inflammatory conditions without proper assessment.)

10.4 Shamana Drugs

Haridra (*Curcuma longa*)

Dose:

500 mg powder twice daily

Duration:

4–8 weeks

Action:

- Anti-inflammatory
- Antioxidant

Yashtimadhu (*Glycyrrhiza glabra*)

Dose:

1–3 g powder daily

Duration:

2–4 weeks

Action:

- Soothes mucosa
- Reduces irritation

Tulsi (*Ocimum sanctum*)

Dose:

2–5 g powder/day

Duration:

2–4 weeks

Action:

- Supports respiratory immunity

10.5 Rasayana Therapy

Guduchi (*Tinospora cordifolia*)

Dose:

500 mg twice daily

Duration:

6–8 weeks

Action:

- Immunomodulatory
- Antioxidant

Chyawanprasha

Dose:

5–10 g daily

Duration:

2–3 months

Action:

- Enhances *Ojas*
- Improves respiratory resistance

11. Preventive Ayurvedic Measures

Dinacharya

Recommended:

- Nasal oil application (*Pratimarsha Nasya*)
- Warm water intake
- Regular sleep
- Seasonal adaptation (*Ritucharya*)

Ahara

Beneficial:

- Warm freshly prepared food
- Light digestible diet
- Seasonal fruits

Avoid:

- Excess cold food
- Heavy oily food
- Processed foods

12. Comparative Understanding

Modern Concept	Ayurvedic Interpretation
Air pollutants	<i>Agantu Nidana</i>
Inflammation	<i>Dosha Prakopa</i>
Mucus hypersecretion	<i>Kapha Vriddhi</i>
Oxidative stress	<i>Ama</i> accumulation
Reduced immunity	<i>Ojas Kshaya</i>
Nasal defense	<i>Pranavaha Srotas Bala</i>

13. Research Gaps

Although Ayurveda provides detailed descriptions of ENT disorders, limitations include:

1. Lack of large-scale clinical trials on *Nasya* in pollution-induced rhinitis
2. Limited biomarker studies evaluating Ayurvedic interventions
3. Absence of standardized protocols for pollution-related disorders
4. Need for integration with environmental medicine

14. Future Perspectives

Future research should focus on:

- Clinical trials evaluating *Nasya* therapy
- Molecular studies on Ayurvedic nasal oils
- Assessment of inflammatory biomarkers
- Personalized preventive approaches based on *Prakriti*

Modern tools such as:

- Spirometry
- Nasal airflow assessment
- Cytokine analysis

may help validate Ayurvedic approaches.

15. Conclusion

Air pollution significantly affects ENT health through oxidative stress, chronic inflammation, impaired mucociliary clearance, and immune disturbance. Ayurvedic concepts of *Pratishyaya*, *Shiro Roga*, *Kapha-Vata Dushti*, *Ama*, and *Srotodushti* provide a comprehensive interpretation of pollution-related ENT disorders. Preventive and therapeutic measures including *Nasya Karma*, *Gandusha*, *Rasayana*, dietary regulation, and lifestyle modification may support nasal and respiratory health. Although classical principles show

conceptual similarity with modern environmental medicine, further evidence-based clinical research is required to establish standardized Ayurvedic protocols for pollution-induced ENT disorders.

16. References (Detailed Vancouver Style)

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