Int J Clin Exp Physiol. 2026;13(1):52-53.
https://www.ijcep.org

Autonomic Dysfunctions in Asthma

Jisnudeep Mandal*, Prabhu N

Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), JIPMER Campus, Puducherry, INDIA.

Asthma is a chronic inflammatory airway disorder which is characterised by bronchial hyperresponsiveness, reversible airflow obstruction, and airway inflammation.[1]

It remains a major global public health challenge, affecting about 7.5% of adults.[1]

Besides the classical immune response, autonomic dysfunction has been strongly implicated in the pathophysiology and clinical progression of asthma.[2]

Pathophysiology of Asthma

The Trigger and Immune Response

- **Allergen/Trigger Exposure:** Inflammation is triggered by allergens (e.g pollen, smoke, cold air or dust mites) which activate the airway epithelial cells.[1]
- **Th2-Mediated Inflammation:** Type 2 helper T (Th2) cells secrete cytokines like IL-4, IL-5, and IL-13 which causes the immune response.[1]
- **IgE and Mast Cell Degranulation:** IL-4 and IL-13 stimulate B cells to produce Immunoglobulin E (IgE) antibodies, which coat mast cells. On re-exposure to the allergen, cross-linking of IgE on mast cells triggers degranulation and release of inflammatory mediators (histamine, leukotrienes, and prostaglandins).[1]

Early-Phase Response (Within minutes)

- **Bronchospasm:** Once released, histamine and leukotrienes cause rapid bronchoconstriction.[1]
- **Mucus Hypersecretion:** Submucosal glands and goblet cells produce excessive amounts of thick mucus.[1]

Autonomic Dysfunctions in Asthma

Autonomic dysfunction - an imbalance between the sympathetic and parasympathetic systems has a significant role in the pathophysiology and severity of Asthma.[2]

DOI: 10.5530/ijcep.2026.13.1.8

Copyright Information :
Copyright Author (s) 2026 Distributed under Creative Commons CC-BY 4.0

Publishing Partner : Manuscript Technomedia. [www.mstechnomedia.com]

Key Features of Autonomic Dysfunction in Asthma

Parasympathetic Dominance

The parasympathetic system (which acts via the vagus nerve and acetylcholine acting on M_3 receptors) is the primary neural driver of bronchoconstriction, airway oedema, and hypersecretion of mucus.[3,4]

Vagal hyperresponsiveness is frequently observed, particularly in nocturnal asthma and chronic or severe cases.[2]

Sympathetic Impairment

The sympathetic system promotes bronchodilation via β_2-adrenergic receptors. In many asthmatic patients, especially those who are affected chronically or with greater severity, sympathetic responses are blunted or diminished.[2]

Correlation with Duration and Severity

Non-invasive autonomic function tests (such as heart rate variability analysis) show that autonomic imbalances worsen as the chronicity and clinical severity of asthma increase. [2,3]

Systemic Involvement

In asthma, autonomic dysfunction is not limited to the lungs, and often affects cardiovascular reflexes as efferent fibres for respiratory and cardiac autonomic functions share central origins in the brainstem.[3,4]

Therapeutic Implications

Anticholinergics

Medications that block muscarinic receptors (such as long-acting muscarinic antagonists like tiotropium or short-acting ipratropium) counteract excessive parasympathetic bronchoconstriction.[1]

β_2-Agonists

Inhalers like albuterol stimulate β_2-adrenergic receptors to relax airway smooth muscle, which helps to override bronchospasms.[1]

CONCLUSION

Recognising asthma as an intertwined neuro-immunological disorder rather than a purely inflammatory condition offers a more complete clinical perspective. Because autonomic imbalance correlates directly with disease chronicity and severity, integrating simple, non-invasive autonomic function tests alongside routine

www.ijcep.org

spirometry could help clinicians evaluate disease progression more holistically and tailor targeted combination therapies.

REFERENCES

1. McCracken JL, Veeranki SP, Ameredes BT, Calhoun WJ. Diagnosis and management of asthma in adults. JAMA. 2017;318(3):279-90. doi: 10.1001/jama.2017.8372. PMID: 28719697.
2. Lutfi MF. Autonomic modulations in patients with bronchial asthma based on short-term heart rate variability. Lung India. 2012;29(3):254-58. doi: 10.4103/0970-2113.99111. PMID: 22919165.
3. Mitkari SP, Pazare PA, Pawar SM. Autonomic dysfunction in patients with bronchial asthma. Int J Biol Med Res. 2011;2:852-5.
4. Bharshankar J, Mandape A. Autonomic Function Tests in Asthmatics of Age 25-46 Years in Central India. J Med Sci Health. 2019;05(02):9-13. doi: 10.46347/jmsh.2019.v05i02.002.

Correspondence:
Dr. Jisnudeep Mandal
Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), JIPMER Campus, Puducherry-605006, INDIA
Email: mjeet129@gmail.com

Received: 17-02-2026;
Revised: 07-03-2026;
Accepted: 09-04-2026.

Cite this article: Mandal J, Prabhu N. Autonomic Dysfunctions in Asthma. Int J Clin Exp Physiol. 2026;13(1):52-53.

www.ijcep.org