

## 11. THE INFLUENCE OF CIRCADIAN RHYTHMS IN THE EXACERBATION OF BRONCHIAL ASTHMA



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**Introduction.** Asthma is an inflammatory disease of the airways, affecting 334 million people globally, of whom 44-61% are prone to developing complications during the night. One of the most important diagnostic criteria for severe asthma, present in 5-10% of asthmatics, is nocturnal symptoms.

**Aim of study.** The purpose of the study was to highlight circadian variations in neurotransmitters and hormones that affect lung function and how disruptions in the internal clock can lead to worsening asthma. Rhythmic changes in respiratory functions are much more pronounced in asthmatic people than in healthy ones. Affecting sleep quality, decreasing productivity, and limiting social functions determined by nocturnal complications among asthmatics reveals the importance of understanding the physiological mechanisms of circadian rhythms on lung functions, which will allow the implementation of effective measures to prevent and alleviate symptoms.

**Methods and materials.** The research is a literature review based on the analysis of 20 articles published in the period 2014-2023 in the databases PubMed, Scopus and Google Scholar, based on the following keywords: "circadian rhythm, asthma".

**Results.** The predominance of the activity of the parasympathetic nervous system at night induces the intense release of acetylcholine on M3 muscarinic receptors, causing the formation of IP3 and increasing the concentration of Ca necessary for contraction, as well as the activation of M2 receptors coupled to the Gi protein, which inhibits adenylate cyclase A, favouring increasing the resistance of the pulmonary pathways. Similarly, stimulation of the ventro-lateral preoptic nucleus, which induces sleep through the release of GABA, inhibits locus coeruleus activity, amplifying the effects of vagal tone on the airways. Increasing serum melatonin concentration during the night increases the synthesis of cytokines, IL-2, IL-6 and IL-12, enhancing the inflammatory response of the pulmonary pathways in asthmatics. The evolution of bronchial asthma is also influenced by the circadian rhythm of cortisol, which inhibits the expression of pro-inflammatory genes. The decrease in cortisol concentration and glucocorticoid receptor affinity during the night intensifies inflammatory processes caused by IgE. Also, cortisol's circadian fluctuations decrease beta-adrenergic receptors' density by 33% during the night, diminishing the bronchodilator effects mediated by epinephrine.

**Conclusion.** Although many factors determine the pathogenesis of asthma, a complete understanding of the mechanisms by which circadian rhythms drive airway hyperresponsiveness to various peripheral modulators is essential. Proper hygiene of circadian rhythms: ensuring quality sleep, sequencing indoor work with exposure to natural light, and minimizing exposure to light from gadgets are other crucial factors in preventing asthma.