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Review on Nocturnal Asthma

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Abstract: *Nocturnal asthma, a condition where asthma symptoms worsen during the night. It aims to examine the causes, effects, and management of nocturnal asthma. We analyzed current literature and studies, highlighting the significance of understanding this condition for better patient care and treatment outcomes. The findings indicate that several factors contribute to nocturnal asthma, which can severely impact the quality of life. Proper management strategies are essential to minimize symptoms and improve sleep quality.Asthma has a tendency to destabilize and get worse at night, probably due to a nocturnal increase in airway inflammation and bronchial responsiveness. Nocturnal airway narrowing in asthma is often associated with sleep disorders, such as episodes of nocturnal and early morning awakening, difficulty in maintaining sleep, and daytime sleepiness. On the other hand, an association has been documented between nocturnal sleep-disordered breathing and asthma. This review highlights the causes of nocturnal worsening of asthma and examines the evidence pointing towards a causal relationship between nocturnal asthma and sleep-disordered breathing..*

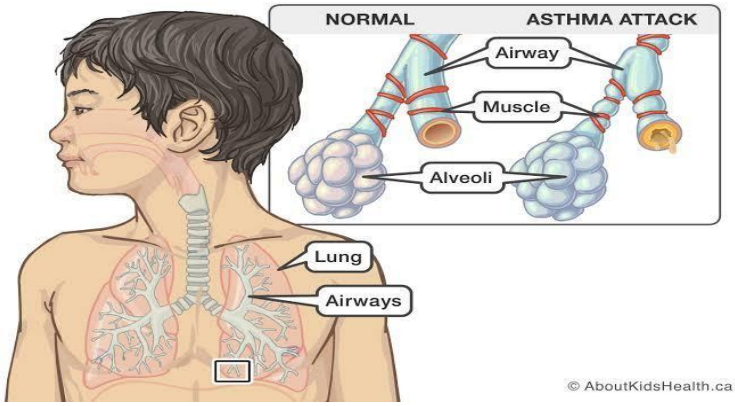
Keywords: Nocturnal asthma; Sleep-disordered breathing; Circadian rhythm; Airway inflammation; Bronchial hyperresponsiveness

I. INTRODUCTION

Nocturnal asthma is a type of asthma that affects many individuals, causing symptoms like coughing, wheezing, chest tightness, and shortness of breath during the night. This condition can disrupt sleep, leading to fatigue and decreased daily functioning. Understanding nocturnal asthma is essential for healthcare providers, as it offers insights into more effective treatment plans.

WHY DOES ASTHMA WORSEN AT NIGHT?

The mechanisms of the nocturnal worsening of asthma are probably multifactorial and interactive. The basic mechanism might be a nocturnal increase in airway inflammation leading to an increase in bronchial responsiveness. Many potential factors have been identified and in some asthmatic subgroups a specific risk factor may increase the likelihood of a nocturnal asthma attack.



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Causes of Nocturnal Asthma

Nocturnal asthma can result from various factors, including:

- **Circadian Rhythms**: The body's natural clock can influence airway function. Studies show that airway inflammation and narrowing may increase at night.
- **Allergens**: Dust mites, pet dander, and pollen are common allergens found in the bedroom. These can trigger asthma symptoms during the night.
- **Environmental Factors**: Changes in temperature and humidity at night can also affect asthma. Cold air may constrict airways, making breathing more difficult.
- **Acid Reflux**: Gastroesophageal reflux disease (GERD) can worsen asthma symptoms when lying down, leading to more severe nocturnal episodes.

Effects of Nocturnal Asthma

Experiencing nocturnal asthma can have several negative effects, such as:

- **Sleep Disruption**: Frequent awakenings due to asthma symptoms can prevent restful sleep.
- **Daytime Fatigue**: Poor sleep quality often leads to tiredness during the day, impacting activities and productivity.
- **Increased Healthcare Use**: Individuals with uncontrolled nocturnal asthma may visit emergency rooms or require more medical attention.

Management and Treatment

Proper management of nocturnal asthma is crucial for improving patient quality of life. Strategies include:

- **Medications**: Long-acting beta-agonists (LABAs) and inhaled corticosteroids can help control symptoms. A healthcare provider should guide the appropriate use of rescue inhalers.
- **Environmental Control**: Reducing allergens in the bedroom, such as using dust-miteproof covers, can improve symptoms.
- **Monitoring Symptoms**: Keeping track of symptoms can help patients recognize patterns and adjust their treatment plan.

Applications of Nocturnal Asthma Management

Understanding how to manage nocturnal asthma can help various groups, including:

- **Patients**: By following a tailored action plan, patients can learn to manage their symptoms effectively, allowing for better sleep and overall health.
- **Healthcare Providers**: Knowledge of nocturnal asthma can lead to more comprehensive assessments and personalized treatments for patients.
- **Researchers**: Studies focusing on nocturnal asthma can enhance understanding of its mechanisms, leading to improved therapies.

Comparison with Related Concepts

Nocturnal asthma is often compared to exercise-induced asthma, where symptoms arise during or after physical activity. Both conditions share similar symptoms but have different triggers. Recognizing these differences is key for effective management.

Challenges and Limitations

Some challenges related to studying nocturnal asthma include:

- **Variability in Symptoms**: The severity and frequency of nocturnal asthma can differ widely among individuals, complicating studies.

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- **Reporting Bias**: Patients may not accurately report symptoms or may not recognize them as asthma-related, leading to underreporting.
- **Treatment Adherence**: Ensuring that patients consistently follow their treatment plans can be difficult, affecting study outcomes.

Future research should focus on discovering new management strategies and addressing the challenges and limitations in current studies.

Symptoms of Nocturnal Asthma:

- **Wheezing**: A high-pitched whistling sound when breathing, especially during exhalation.
- **Coughing**: Typically worse at night, especially when lying down.
- **Shortness of breath**: Feeling tightness in the chest or struggling to breathe deeply.
- **Increased mucus production**: Often exacerbating congestion or discomfort.
- **Poor sleep quality**: Frequent waking during the night due to symptoms.

Causes:

The exact cause of nocturnal asthma isn't fully understood, but several factors contribute to it:

- **Airway inflammation**: During sleep, airway inflammation can worsen, making it harder to breathe.
- **Body position**: Lying down can increase pressure on the lungs and make it harder for people with asthma to breathe effectively.
- **Circadian rhythms**: The body's natural rhythms may play a role in increased inflammation or narrowing of the airways at night.
- **Allergens**: Dust mites, pet dander, or other allergens present in the bedroom can trigger nighttime asthma symptoms.
- **Cool air**: Breathing cooler air at night, especially during colder months, can also worsen asthma symptoms.
- **Reduced medication efficacy**: Asthma medications might wear off by night, especially if long-acting medications aren't properly timed.

Impact:

Nocturnal asthma can seriously affect quality of life:

- **Sleep disruption**: Frequent wake-ups due to asthma symptoms can lead to insomnia, fatigue, and difficulty concentrating during the day.
- **Increased asthma attacks**: Poorly controlled nocturnal asthma increases the risk of more severe asthma attacks.
- **Chronic symptoms**: Persistent nocturnal asthma symptoms can indicate that asthma is not well-managed during the day, which may lead to overall worsening of the condition.

Diognosis :

The diagnosis of asthma involves a combination of medical history, physical examination, and lung function tests. Here's a breakdown of the process:

Medical History

- Symptoms: Wheezing, coughing (especially at night), shortness of breath, chest tightness.
- Triggers: Allergens, cold air, exercise, smoke, strong odors, stress, or respiratory infections.
- Family History: A history of asthma, allergies, or eczema in the family.
- Previous Respiratory Issues: Frequent colds that last longer than usual or turn into bronchitis.

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Physical Examination

- Listening to lung sounds using a stethoscope to check for wheezing.
- Checking for allergic signs like nasal congestion, swollen nasal passages, or skin conditions (eczema).

Lung Function Tests (Pulmonary Function Tests - PFTs)

- Spirometry: Measures how much air you can inhale and exhale and how fast you can blow air out.
- Peak Flow Meter: A small device that measures how well you can force air out of your lungs.
- Bronchodilator Reversibility Test: Spirometry is repeated after using an inhaler to see if lung function improves.
- Methacholine Challenge Test: If spirometry is inconclusive, this test triggers mild airway narrowing in people with asthma.

Additional Tests

- Allergy Testing: To check for allergic asthma triggers.
- Chest X-ray or CT Scan: To rule out other lung conditions.
- Exhaled Nitric Oxide Test (FeNO): Measures inflammation in the airways.

Current challenges in asthma diagnosis

Asthma is a heterogeneous clinical syndrome. While we now begin to understand the mechanisms driving some of the asthma phenotypes and endotypes, our knowledge remains limited, impeding accurate asthma definition and diagnosis. In spite of this complexity, the clinical features of asthma include (some or all of) reversible airflow obstruction, airway inflammation and bronchial hyperresponsiveness (BHR).All the currently available diagnostic tests are aimed at demonstrating one or more of these features. Peak expiratory flow (PEF), lung function and reversibility tests demonstrate airflow obstruction and variability, bronchoprovocation challenges examine BHR. FeNO, allergic sensitisation tests (skin prick test and immunoglobulin E (IgE)) and serum/sputum eosinophil counts are inflammatory biomarkers. In addition to clinical symptoms, an asthma diagnosis should be supported by objective evidence of variable airflow obstruction or inflammation, yet there is no single ‘gold-standard’ test. Adding to the challenge, national clinical guidelines have published somewhat conflicting recommendations, causing much concern among healthcare professionals. In a population-based birth cohort study, the asthma diagnostic algorithm for children recommended by the National Institute for Health and Care Excellence (NICE) was applied to 772 children. Strikingly, in this population, only 3% of children with current asthma had FEV1 to FVC ratio (FEV1 :FVC) of less than 70%.20 Bronchodilator reversibility tests (BDR) and FeNO also demonstrated poor diagnostic accuracy using the recommended cut-off values. This raises concerns over the potential for delayed diagnosis in children or misdiagnosis; the comprehensive review of the literature that accompanied this guidance clearly demonstrated the paucity of evidence for the use of spirometry and bronchodilator reversibility in children.Acknowledging that asthma is an umbrella term covering this heterogeneity, in 2015, Global Initiative for Asthma simplified their asthma definition to aid diagnosis in clinical practice.This new definition highlights the cardinal features of variability in asthma: ‘a history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity” and “variable expiratory airflow limitation’. Despite this, the diagnostic guidelines continue to predominantly rely on using fixed and arbitrary cut-off values in the interpretation of tests, with little emphasis on the timing of measurementsand how this may affect diagnostic accuracy. In this review, we will provide evidence that virtually all asthma diagnostic tests demonstrate diurnal and longer term variation; we will show how variability and timing impact asthma diagnosis and management. We provide an overview of the biological clock mechanism and highlight areas for future research

Management & Treatment:

Effective management of nocturnal asthma typically involves a combination of lifestyle changes and medical treatments:

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- **Asthma medications**: Controllers like inhaled corticosteroids or long-acting beta agonists (LABAs) can help prevent symptoms. Quick-relief (rescue) inhalers are used to alleviate symptoms during an attack.
- **Allergen avoidance**: Keeping the bedroom free of allergens (e.g., dust mites, pet dander) and using hypoallergenic bedding can help reduce triggers.
- **Humidification**: Using a humidifier in the bedroom can reduce irritation from dry air.
- **Elevating the head**: Sleeping with the head raised can help reduce pressure on the lungs and improve breathing.
- **Regular asthma check-ups**: Working with a healthcare provider to ensure asthma is under control, adjusting medications as necessary.

Survey:

Key facts

Asthma is a major noncommunicable disease (NCD), affecting both children and adults, and is the most common chronic disease among children.

Inflammation and narrowing of the small airways in the lungs cause asthma symptoms, which can be any combination of cough, wheeze, shortness of breath and chest tightness.

Asthma affected an estimated 262 million people in 2019 (1) and caused 455 000 deaths.

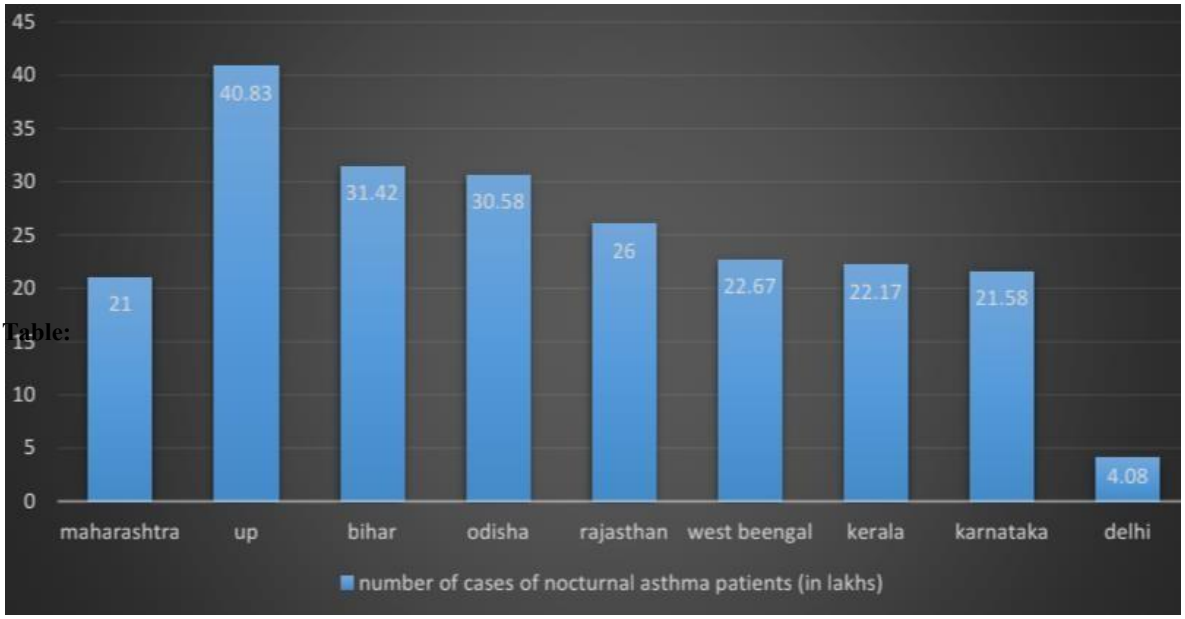
Inhaled medication can control asthma symptoms and allow people with asthma to lead a normal, active life.

Avoiding asthma triggers can also help to reduce asthma symptoms.

Most asthma-related deaths occur in low- and lower-middle-income countries, where underdiagnosis and under-treatment is a challenge.

WHO is committed to improving the diagnosis, treatment and monitoring of asthma to reduce the global burden of NCDs and make progress towards universal health coverage.

Graph:



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NO OF STATES	NO OF PATIENTS (IN LAKHS)
MAHARASHTRA	21
UP	40.83
BIHAR	31.42
ODISHA	30.58
RAJASTHAN	26
WEST BENGAL	22.67
KERALA	22.17
KARNATAKA	21.58
DELHI	4.08

II. CONCLUSION

Nocturnal asthma is a challenging aspect of asthma that requires proactive management. If you or someone you know experiences worsening asthma symptoms at night, it's important to address it with a healthcare provider to ensure optimal treatment and to improve sleep quality. Proper asthma control during the day, along with specific nighttime strategies, can help reduce the impact of nocturnal asthma.Nocturnal asthma represents a significant clinical challenge, characterized by worsening symptoms during the night that disrupt sleep and reduce quality of life. Its pathophysiology is multifactorial, involving circadian variations in lung function, increased airway inflammation at night, and altered hormonal levels such as cortisol and melatonin. Poorly controlled nocturnal asthma is associated with increased morbidity and even mortality. Early recognition, patient education, and proper management strategies—including optimizing controller medications, addressing comorbidities such as GERD or allergic rhinitis, and monitoring nighttime symptoms—are essential to improving outcomes. Further research is needed to understand the molecular mechanisms driving nighttime symptom exacerbation and to develop more targeted therapies for this often-overlooked aspect of asthma.

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