

The Names of God

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دانشگاه علوم پزشکی کرمان



دانشگاه علوم پزشکی و خدمات بهداشتی درمانی آبادان

*Sleep
Disorders in
Asthma
Patients*

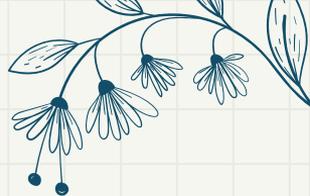


The best bridge between despair and hope
is a good night's sleep.

E. Joseph Cossman

The worst thing in the world is to try to sleep
and not to.

F. Scott Fitzgerald



→ **TABLE OF CONTENTS:**

↖ **Overview**

1 **Definition
prevalence**

2 **Mechanisms
of nocturnal
asthma**

3 **Common sleep
disorders in
asthma**

4 **Impact
on asthma
control**



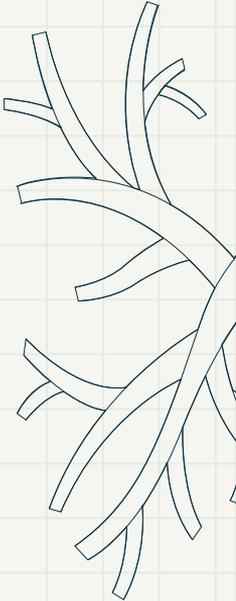
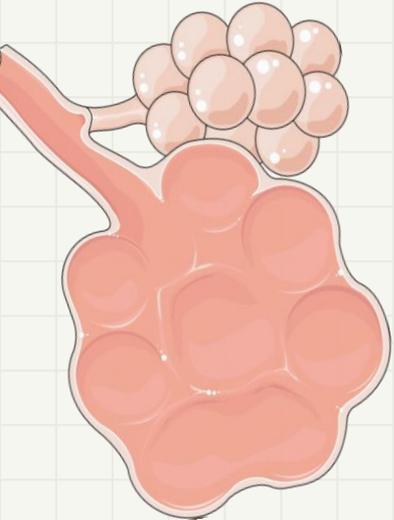
5 **Diagnostic
approach**

6 **Management
strategies**



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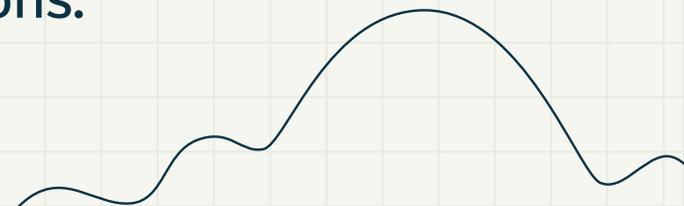
Overview, Definition and prevalence





A recent study found that:

- people who get fewer than 6 hours of sleep experience 1.5 times more asthma attacks and have a poorer health-related quality of life than those who sleep the recommended 7 to 9 hours each night.
- Poor sleep in people with asthma may also be related to the presence of other health conditions, including sleep disorders, and the stimulating effects of asthma medications.



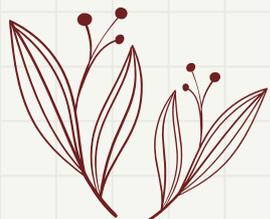


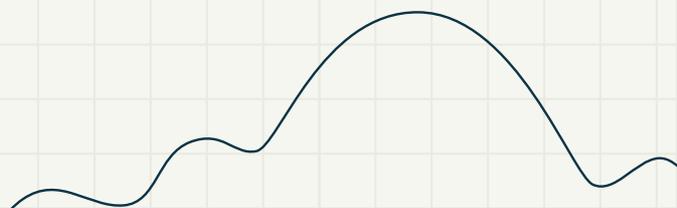
Asthma and Sleep:

- A Two-Way relationship asthma symptoms often worsen at night (nocturnal asthma).
- Poor sleep quality further impairs asthma control.

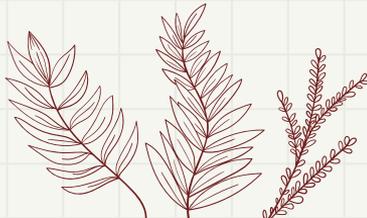


**Shared
pathophysiologic
pathways:**



- 1. Airway inflammation**
 - 2. Autonomic imbalance**
 - 3. Obesity and GERD**
 - 4. Sleep fragmentation**
 - 5. Hypoxia**
- 

- Sleep is a physiologic state with altered respiratory mechanics and autonomic balance. Asthma frequently worsens at night because FRC decreases, airway edema increases and cholinergic tone rises.
- Nocturnal symptoms are an early signal of poor control and strongly correlate with morbidity and impaired quality of life.



Sleep and immunity

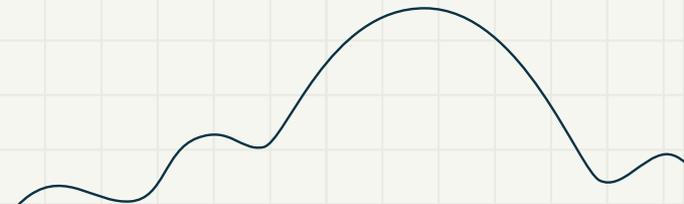
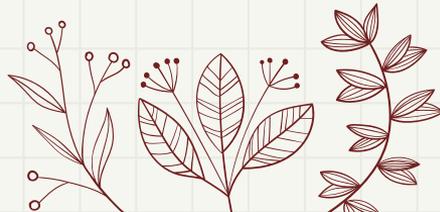
- Proinflammatory mediators such as leukotrienes (LTs), histamine, and acetylcholine are pivotal in orchestrating inflammatory responses.
- Leukotrienes, primarily produced by leukocytes and part of the eicosanoid family, act as potent inflammatory mediators with a critical role in inflammation.
- Their production can be triggered by both immunological and non-immunological stimuli including antigens, immune complexes, and cytokines .
- Histamine, released by basophils, which also produce LTs, suggests a connection between histamine and LTs in inflammatory responses



- The intimate connection between sleep and respiratory inflammation is exemplified by nocturnal asthma. Individuals with this condition often experience symptom exacerbations at night, peaking in the early morning hours.
- This pattern is believed to be influenced by the circadian rhythm's impact on inflammatory mediators, coupled with a natural tendency for bronchoconstriction at dawn.



- “Previous research revealed that poor sleep quality has a negative effect on asthma symptoms in adolescents,” says Faith Luyster, PhD, lead author of the study. Our study shows that adults with asthma are equally affected by too little (or sometimes too much) sleep.
- Compared to normal sleepers, short and long sleepers had a higher proportion of people who reported having an asthma attack in the past year (45% vs 59% and 51% respectively) and had more days with impaired health-related quality of life. Impaired quality of life was characterized by more days of poor physical and mental health.



- Up to 60-74% of patients with persistent asthma report nocturnal symptoms, and 30-40% have clinically significant sleep disruption.
- Nocturnal asthma is independently associated with increased ER visits, more systemic corticosteroid use and higher mortality risk.



- Prevalence Up to 60-80% of asthmatic patients report sleep disturbances.
- Nocturnal symptoms (wheezing, cough, dyspnea) occur in >50% of uncontrolled asthma.
- Sleep disorders such as OSA are 2-3 times more common in asthmatics (GINA 2025).



2

Mechanisms of

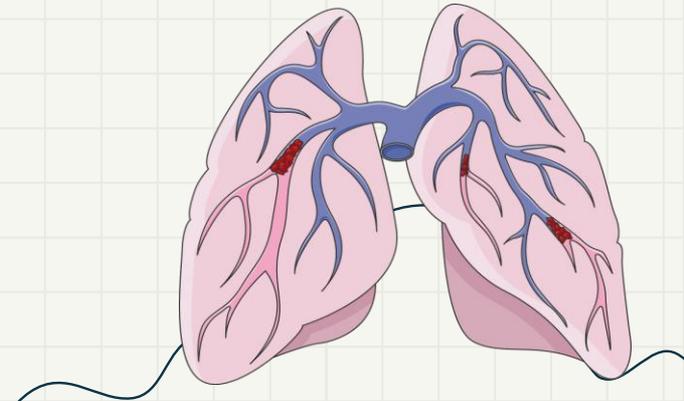
Nocturnal Asthma



- Circadian variation in airway tone and inflammation:

Increased parasympathetic activity → bronchoconstriction
Supine position → reduced lung volumes

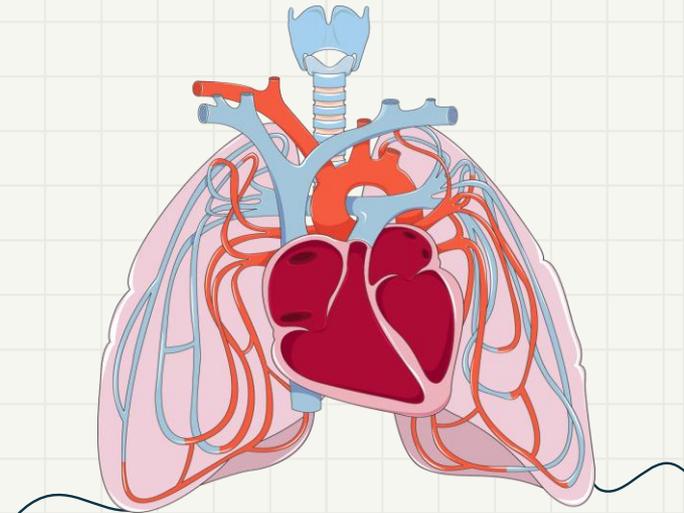
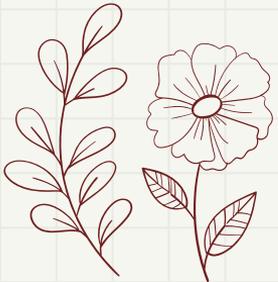
- Gastroesophageal reflux → airway irritation
Increased mucus and airway resistance at night



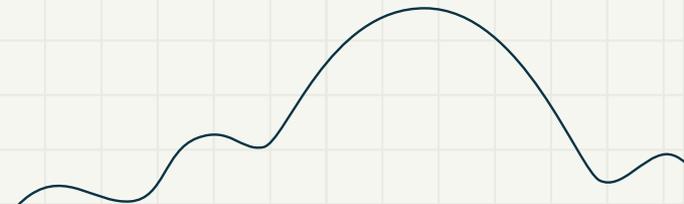
- During sleep, circadian shifts in cortisol and catecholamines lower anti-inflammatory defense. Simultaneously, type-2 cytokines (IL-5, IL-13) increase during the night.
- This imbalance amplifies eosinophilic inflammation and bronchial hyperreactivity, especially during REM.



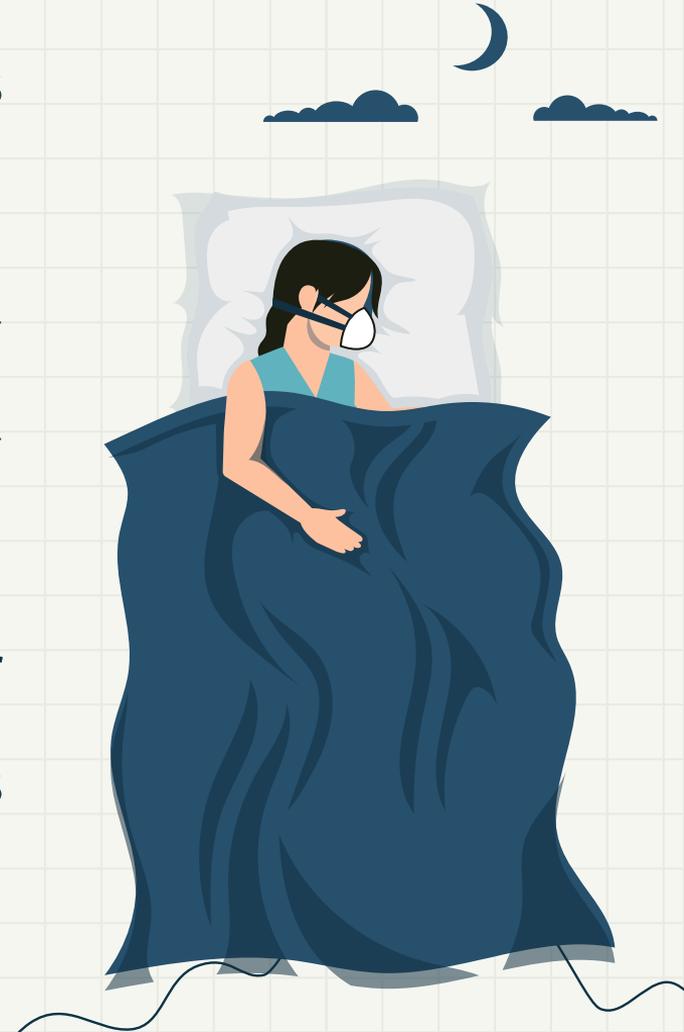
- Supine sleep reduces FRC and increases small airway closure. In asthma, this effect is exaggerated due to airway wall thickening, mucus and instability of MICA.
- Dynamic hyperinflation decreases and work of breathing increases, these amplify dyspnea arousals.



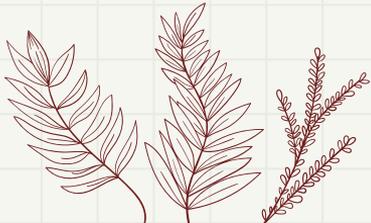
- Asthma patients are at higher risk for insomnia, restless sleep, sleep fragmentation, nocturnal coughing episodes and excessive daytime sleepiness.
- These problems persist even after adjustment for inhaled steroid use or obesity.



- Obstructive sleep apnea is 2–3 times more prevalent in asthma.
- OSA promotes intermittent hypoxia → oxidative stress → airway inflammation → worse asthma control.
- Conversely, asthma itself increases upper airway collapsibility and CPAP improves asthma control.



- Nocturnal reflux can trigger bronchoconstriction via microaspiration or esophago-bronchial vagal reflex.
- Treating reflux improves nighttime asthma symptoms in selected patients, but empiric PPI in asymptomatic GERD is NOT recommended.



- Red flag indicators include:
 - frequent nighttime rescue inhaler use
 - waking $\geq 2x$ /week due to asthma
 - morning fatigue
 - unexplained daytime sleepiness
 - non-refreshing sleep or new snoring
- These require evaluation for sleep pathology.



- Nighttime drop in endogenous cortisol increases airway inflammation and lowers β_2 -receptor responsiveness, explaining why late-evening symptoms are markedly worse in uncontrolled asthma.



3

Common Sleep Disorders in Asthma Disorder

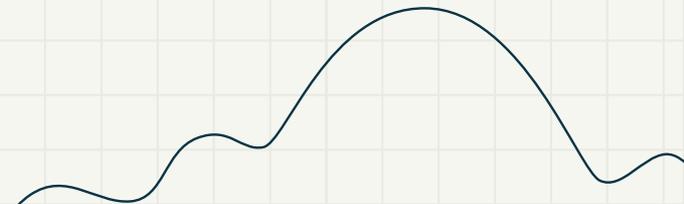
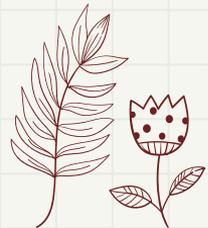




Impact on Asthma:

- Obstructive Sleep Apnea (OSA), Snoring, witnessed apnea
- daytime sleepiness, \uparrow nocturnal symptoms, \downarrow asthma control
- Insomnia, Difficulty falling/staying asleep, Fatigue, anxiety, poor adherence
- Restless Legs Syndrome (RLS), Uncomfortable leg sensations
- Sleep fragmentation, Sleep-related GERD Nocturnal cough, choking

Worsens airway inflammation.



- Initial evaluation requires assessment of asthma control (GINA), sleep history (bedtimes, awakenings, snoring, witnessed apneas) and validated tools such as ACT, ESS or STOP-BANG.
- Persistent nocturnal symptoms despite guideline therapy should trigger sleep investigation referral.

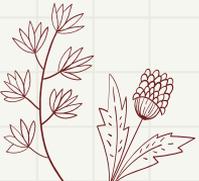
STOP-BANG - Screening for Obstructive Sleep Apnea (OSA)

- S** Snoring
- T** Tiredness / Daytime Sleepiness
- O** Observed Apneas
- P** High Blood Pressure
- B** BMI > 35 kg/m²
- A** Age > 50 years
- N** Neck Circumference > 40 cm (~16 inches)
- G** Gender: Male

Risk of OSA	
0-2	Low
3-4	Intermediate
5-8	High

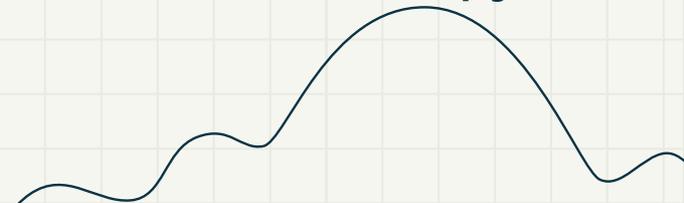
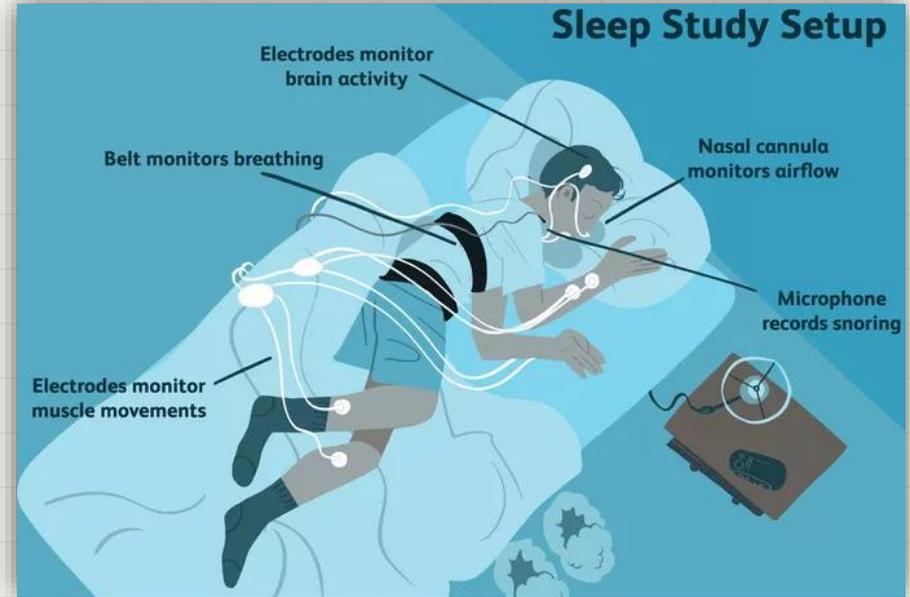


- Overnight oximetry is not diagnostic for OSA, but desaturation clusters and variability help detect possible sleep-disordered breathing.
- It is a low-cost triage tool to prioritize full PSG in patients with asthma + nocturnal symptoms.



Full PSG is indicated in patients with asthma who have:

- new snoring
- witnessed apneas
- morning headaches
- non-refreshing sleep
- unexplained nocturnal dyspnea
- refractory nocturnal asthma despite optimized asthma therapy.



- Management includes optimizing anti-inflammatory control, inhaled steroid timing, treating comorbid OSA (CPAP), targeted reflux therapy only if symptomatic GERD, sleep hygiene, and reducing nighttime exposures (dust mite/allergen), these improve nocturnal indices.



4. BRONCHIAL ASTHMA

Physiological disturbance Clinical consequences

I. Fragmentation of sleep by frequent arousals,

1. Recurrent awakenings loss of slow-wave sleep
2. Restless sleep
3. Unrefreshing sleep
4. Morning headaches
5. Daytime sleepiness
6. Cognitive impairment
7. Personality changes

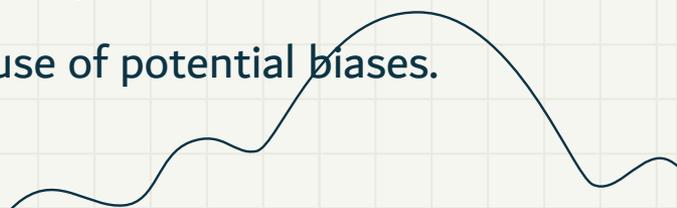
II. Recurrent nocturnal hypoxaemia or asphyxia;

1. Nocturnal cardiac arrhythmias increased cardiac afterload
2. Paroxysmal nocturnal dyspnea
3. Nocturnal angina pectoris
4. Pulmonary hypertension
5. Systemic hypertension
6. Left ventricular dysfunction
7. Chronic respiratory failure
8. Insulin resistance

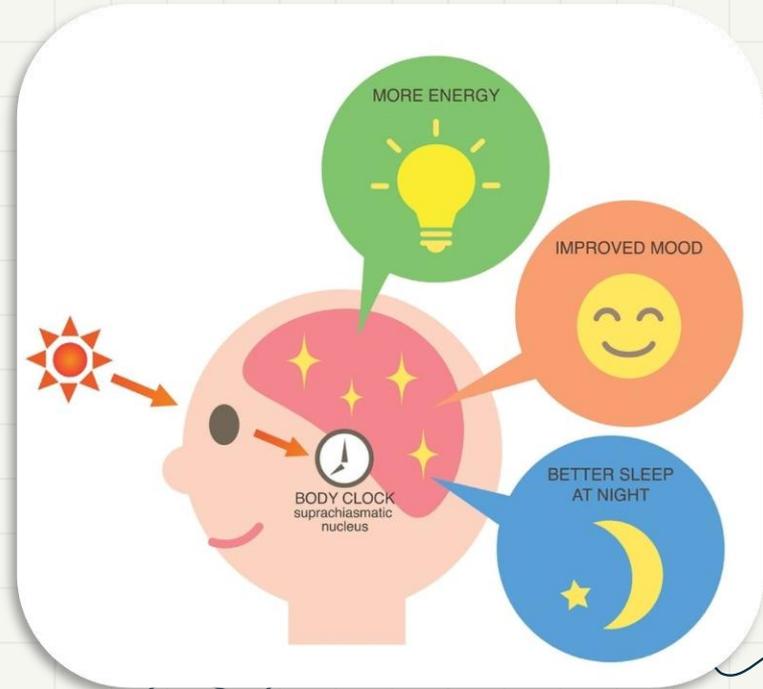
Bradley D, Eliot A, Phillipson MD. Sleep disorders in breathing. In: Murray and Nadal Textbook of Respiratory Medicine, 4th ed. Philadelphia: Elsevier Saunders 2005; 107: 1671-1678

Association of sleep disorders with asthma: a meta-analysis

Author affiliations • Xueqian Liu ¹, Cheng Hong ², Zhiyu Liu ³, Lihua Fan ², Moqing Yin ², Yunhu Chen ², Xiang Ren ¹  , Xuefang Gu ⁴ 

- Results: 23 studies were included in the primary analysis, which suggested a positive association between sleep disorders and asthma (OR: 1.38, 95% CI 1.10 to 1.74). Subgroup analyses were conducted according to the study design, age, family history of asthma and type of sleep disorders. We did not find any association between sleep disorders and asthma in children aged <12 years (OR: 1.13, 95% CI 0.97 to 1.32). The association was insignificant in studies where the family history of asthma was adjusted for (OR: 1.16, 95% CI 0.94 to 1.42). Funnel plot and Egger's test indicated a significant publication bias.
 - Conclusion: Sleep disorders are associated with an increased prevalence and incidence of asthma. However, the quality of the evidence was low because of potential biases.
- 

- ICS dosing aligned with circadian pattern (evening dosing) may enhance control because airway inflammation peaks at night.
- Chronotherapy does not replace guideline step-up, but can refine control in selected patients.



- CPAP increases upper airway stability → improves nocturnal ventilation → reduces intermittent hypoxia → lowers systemic inflammatory burden.
- Meta-analysis shows CPAP improves ACT score and morning PEFR in asthmatic OSA patients.



- If cough is the dominant nighttime symptom without wheezing, consider UACS, GERD, chronic cough hypersensitivity, or insomnia.
- Symptom phenotype is crucial before escalation of asthma therapy.

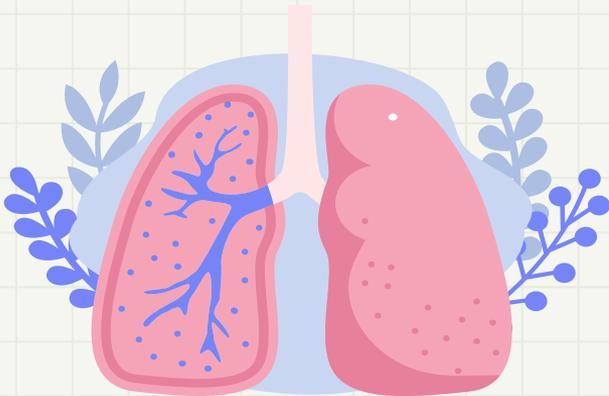


- Do not empirically escalate ICS/LABA blindly if nighttime symptoms persist.
- Do not prescribe empiric PPI in GERD-negative patients.
- Do not ignore new snoring.

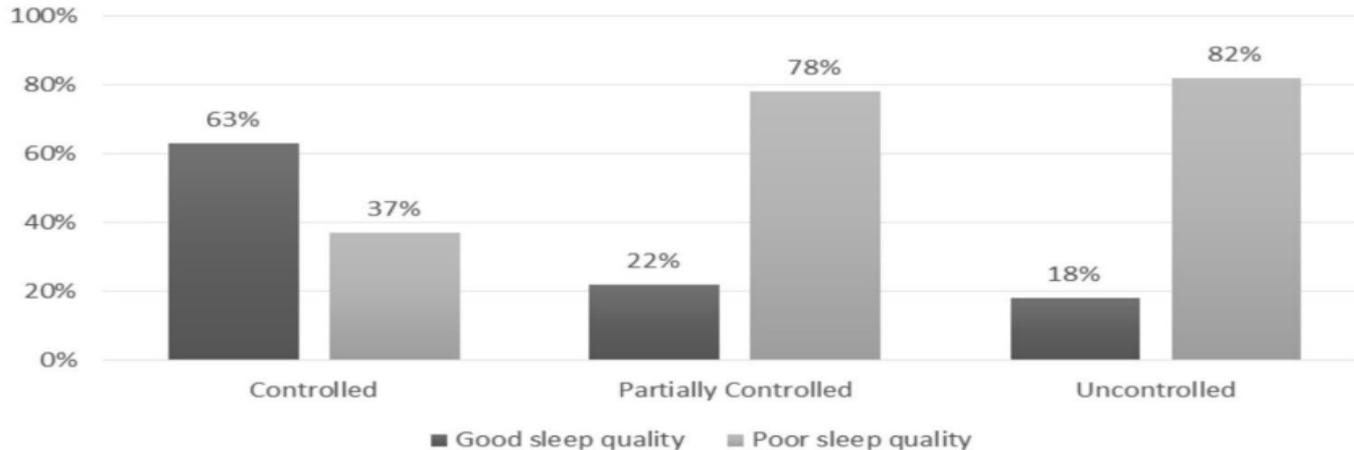


- Nocturnal asthma =
an inflammatory / mechanical / neural
interaction amplified by sleep.

- Treat the asthma + treat the sleep.



- Poor sleep quality was common among patients with asthma, especially those with suboptimal levels of asthma control.
- In addition, patients with uncontrolled asthma had a higher risk for OSA and were more likely to report insomnia and excessive daytime sleepiness.

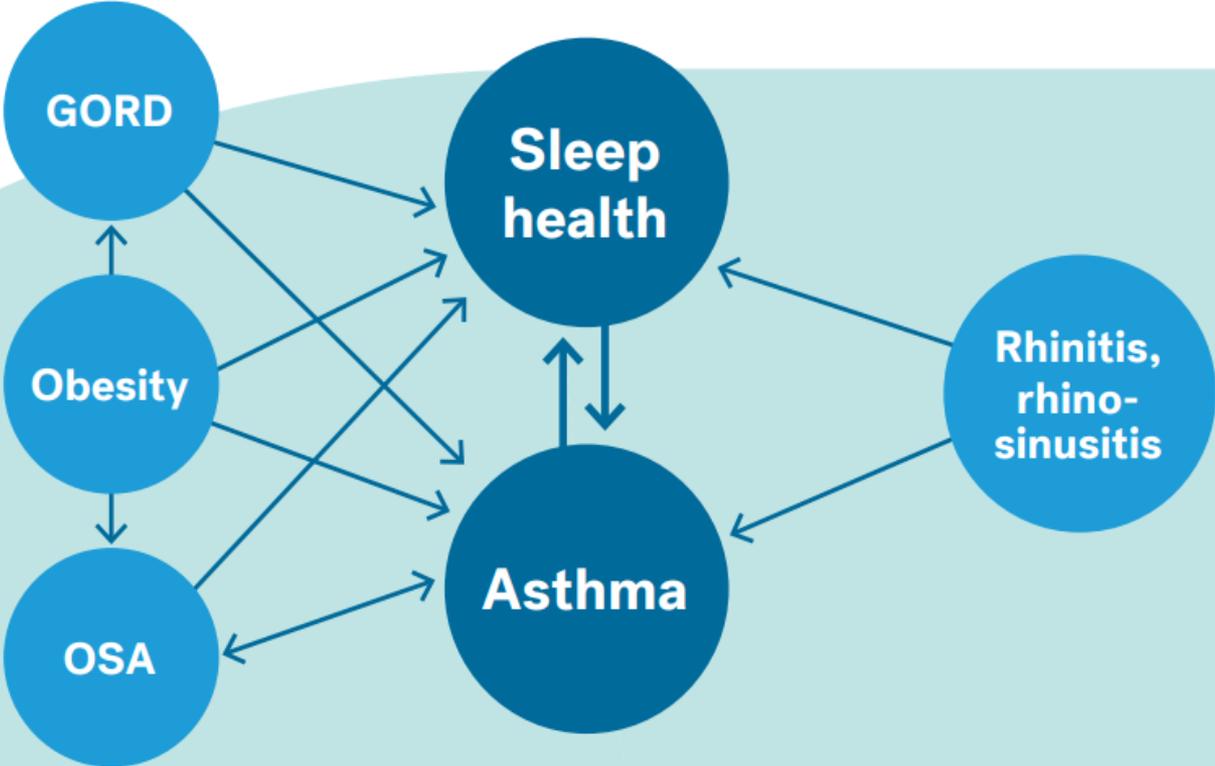


UNDERSTANDING HOW SLEEP DISORDERS ARE MANAGED IN PEOPLE WITH ASTHMA: A SCOPING REVIEW OF THE LITERATURE

Results: For people with OSA and asthma, continuous positive pressure devices, oral appliances and bariatric surgery improved sleep and asthma outcomes. Improvements in other sleep disorders and asthma were shown with behavioral interventions and digital interventions including fitness tracker use.

Conclusion: The limited studies retrievable on this topic suggest management of sleep disorders in people with asthma is an under-researched area. Future research directed at how and when to assess sleep management in people with asthma will better inform specific guidelines and achieve improved sleep health in this population.

Associations between asthma and sleep



Asthma, common comorbidities, and sleep health

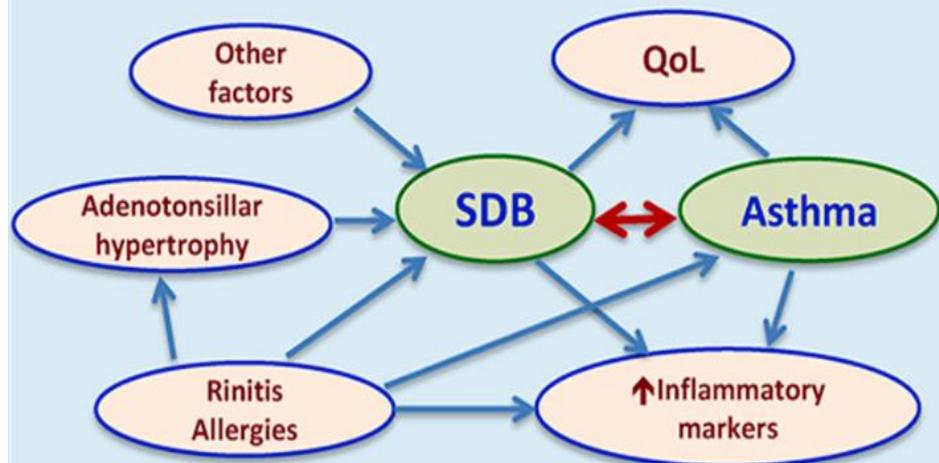
Condition	Effects on sleep health	Relevance to asthma
OSA	Unrefreshing sleep, fatigue, poor concentration, low mood, excessive daytime sleepiness ⁸	<p>Estimated prevalence 20–40% in people with asthma⁹ – likely bidirectional risk association¹⁰</p> <p>Associated with increased rates of asthma exacerbations, including severe exacerbations, and with lower quality of life and asthma control^{10,11}</p> <p>Severity of OSA may be correlated with rate of severe asthma exacerbations¹¹</p> <p>CPAP treatment for OSA improves asthma-related quality of life,¹⁰ and may improve asthma symptom control¹²</p>
Obesity	Major risk factor for OSA ⁸	<p>Associated with development of some asthma phenotypes¹⁰</p> <p>Contributes to asthma symptoms and difficulty managing asthma¹⁰</p> <p>Weight loss is associated with improvements in asthma-related quality of life, asthma control and lung function¹³</p>
Allergic rhinitis	Sleep disturbance ¹⁴	Estimated prevalence up to 80% in people with asthma ⁹

Chronic rhinosinusitis	Sleep disturbance ^{15,16}	Estimated prevalence 22–42% in people with asthma ⁹
ILO	Can occur during sleep ¹⁷	Estimated prevalence 19% in people with asthma ⁹ Can mimic asthma
GORD	Sleep disturbance ¹⁸ Exacerbated by sleep deficiency ¹⁸	Common in people with asthma ¹⁰
Anxiety and depression	Contribute to poor-quality sleep	Estimated prevalence of anxiety symptoms 32% and anxiety disorders 24% in people with asthma ¹⁹ Anxiety and depression common in severe asthma ²⁰

CPAP: continuous positive air pressure; GORD: gastro-oesophageal reflux disease; ILO: inducible laryngeal obstruction (vocal cord dysfunction/upper airway dysfunction); OSA: obstructive sleep apnoea

SLEEP-DISORDERED BREATHING AND ASTHMA CONTROL IN CHILDHOOD

LITERATURE FINDINGS

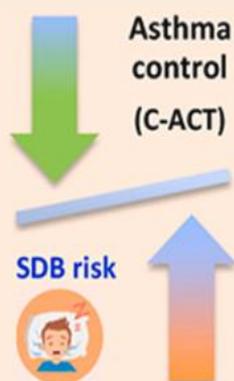


- Bidirectional relationship between **Sleep-Disordered Breathing (SDB)** and **Asthma**: (a) SDB shares important risk factors and comorbidities with Asthma; (b) inflammation plays a pathogenic role in both conditions.
- **SDB**: (a) more common in asthmatic vs. non-asthmatic children; (b) diagnosed more frequently in children with severe asthma.
- **Uncontrolled asthma**: commonly associated with respiratory exacerbations and SDB.

OUR FINDINGS



C-ACT: Asthma Control Test



- **Uncontrolled asthma** (C-ACT ≤ 19): associated with a 4.15-fold increased risk of SDB.
- **PEDS QL** (Quality of Life) score: associated with a lower risk of SDB ($p\text{-value} = 0.002$).

Asthma + SDB



R_x Action Steps

If you have asthma and/or COPD, you may be at increased risk for sleep problems. Talk to your healthcare provider if you:

- ✓ Have more frequent asthma/ COPD symptoms and are not sleeping well.
- ✓ Have conditions that can make sleeping and disease control worse such as being overweight, nasal congestion, or regular heartburn.
- ✓ Are sleepy during the day, even after you have slept all night.
- ✓ Snore, make choking noises, or have breathing pauses during sleep, as you may have obstructive sleep apnea.
- ✓ Wake up in the morning with headaches.
- ✓ If you smoke, quit.
- ✓ Follow good sleep practices.
- ✓ Work with your healthcare team to keep your lung disease in good control.

Healthcare Provider's Contact Number:

For most people with breathing troubles, lying flat on your back isn't going to help. Your body can't as easily clear your airways like that. And sleeping on your stomach can cause a host of issues, like back and neck pain, for a lot of people.



Case 1

- A 48 year old female, non-obese
- ACT = 12
- uses SABA at 3 a.m. 4×/week
- ICS/LABA already at medium dose
- No reflux symptoms
- Husband reports loud snoring and pauses
- STOP-BANG = 5



Answer:



- Full PSG performed → moderate OSA.
- CPAP started → night symptoms resolved without increasing steroids.
- OSA confirmed → CPAP improved nocturnal cough.
- ICS escalation alone would not help.



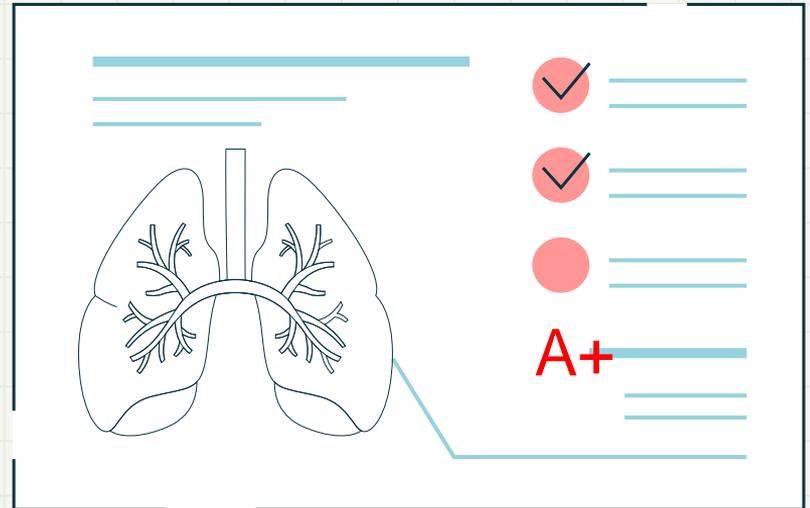
Case 2

- A 33 year old atopic male with high FeNO
- Night coughing + rhinorrhea
- ESS normal
- PSG normal
- Skin testing positive for dust mite



Answer:

- Bedroom dust removal + encasing + evening ICS timing
→ improved nocturnal symptoms.



Case 3

- 60-year-old obese male on high-dose ICS/LABA still waking 2-3 times per night.
- Denies snoring.
- Has retrosternal burning at night.
- pH impedance positive.



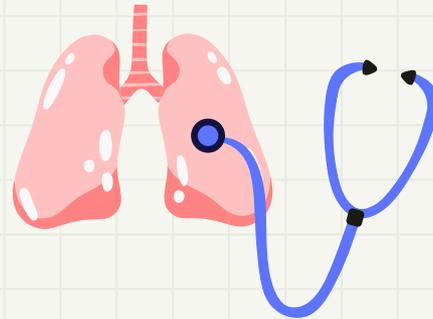
Answer:

- Targeted GERD therapy + head of bed elevation → nocturnal asthma events decreased.
- True nocturnal asthma → ICS/LABA step-up + add LTRA.



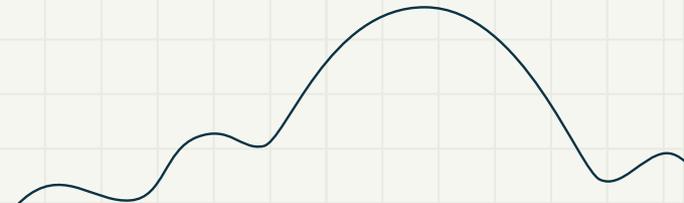
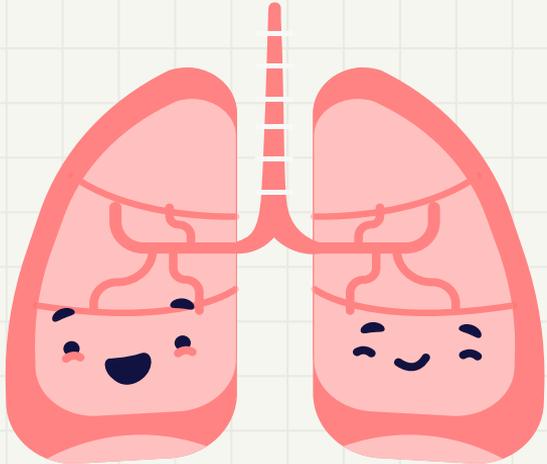
Case 4

- A 27-year-old female
- anxiety-prone
- awakens multiple times “anticipating” asthma attacks
- Spirometry and PSG normal
- FeNO low



Answer:

- CBT-I done → sleep improves → no therapy escalation needed.
- Primary insomnia → CBT-I + optimize controller therapy.



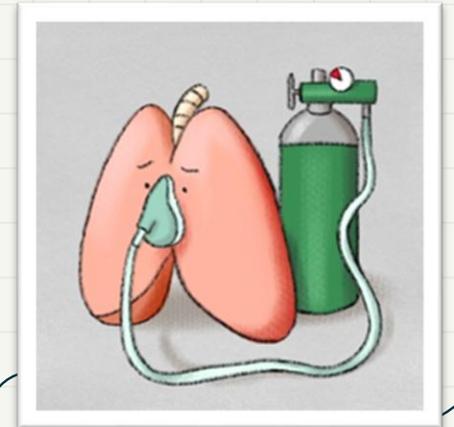
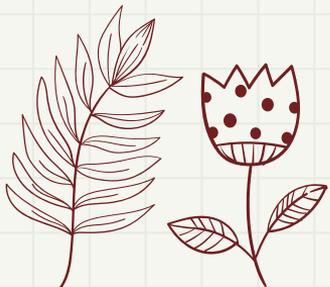
Case 5



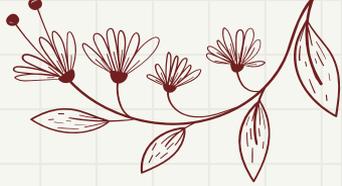
- A 42-year-old teacher
- PEF 420 in afternoon but 300 at 4 a.m.
- No GERD
- Allergic rhinitis poorly controlled

Answer:

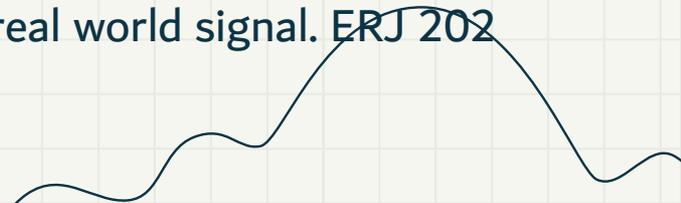
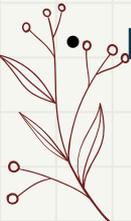
- Nasal steroid started + antihistamine → nocturnal dips resolved.
- Multifactorial → CPAP + GERD management + ICS/LABA intensification.



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May 11, 2020

First study examining adults with asthma shows negative impacts of sleep deprivation.

ARLINGTON HEIGHTS, Ill. – (May 12, 2020) – A good night's sleep is crucial to good health. A [new article](#) in *Annals of Allergy, Asthma and Immunology*, the scientific journal of the American College of Allergy, Asthma and Immunology (ACAAI) reveals that too little sleep, and occasionally too much sleep, can negatively impact adults with asthma.

How does sleep influence asthma through immunity?

[Ahmad Z. Al Meslamani](#)^a College of Pharmacy, Al Ain University, Abu Dhabi, United Arab Emirates;^b AAU Health and Biomedical Research Center, Al Ain University, Abu Dhabi, United Arab Emirates Correspondence Ahmad.almeslamani@aau.ac.ae

The prevalence of sleep disturbance among asthmatic patients in a tertiary care center

Tammam M. Alanazi¹, Hazim S. Alghamdi¹, Meshal S. Alberreet¹, Abdulaziz M. Alkewaibeen¹, Abdulrahman M. Alkhalefah¹, Aamir Omair^{1,4}, Hamdan AL-Jahdali^{1,2,3} & Abdullah AL-Harbi^{1,2,3}✉

Mat Soc Med, 2011; 23(4): 235-237

doi: 10.5455/msm.2011.23.235-237

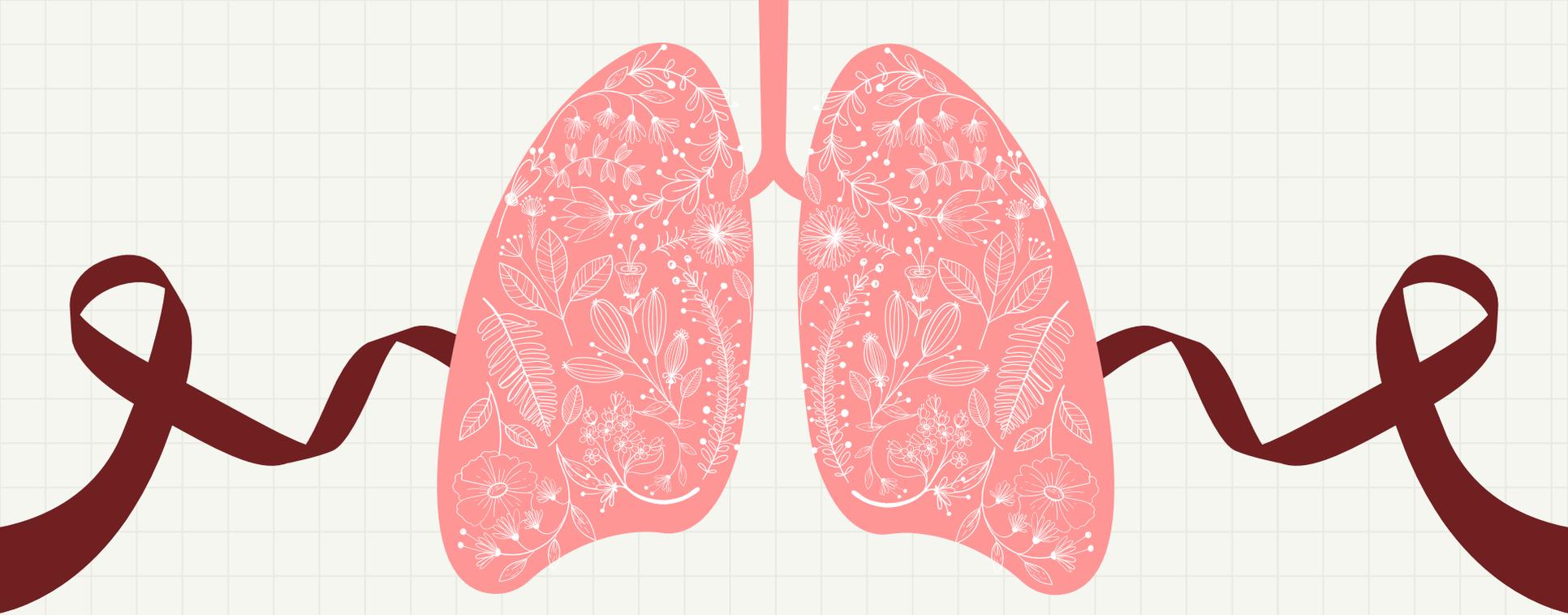
Received: 10 July 2011 | Accepted: 05 September 2011
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Sleep Disorders in Patients with Bronchial Asthma

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