Sleep Disorders Prevalence and Quality of Sleep in Chronic Lung Disease

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Author Disclosures

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Learning Objectives

• Learn about the prevalence of sleep disorders in chronic lung disease
• Learn about the impact of sleep disturbances on quality of life in chronic lung disease
• Learn about the assessment of sleep quality in chronic lung disease
Epidemiology

• 2,187 subjects in Tucson Epidemiologic Study of Obstructive Airways Disease (TESOAD) surveyed in 1985 for sleep complaints (1)
• 41.4% subjects had at least 1 complaint of disturbed sleep

(1) Prevalence of reported sleep disturbances in general adult population and relationship to obstructive airways diseases, Klink, M, Quan, SF, Chest 1987
Chronic Lung Disease

- DIMS: Difficulty initiating and maintaining sleep
- EDS: Excessive daytime sleepiness
- NM: Nightmares

Klink, M et al, Chest 1987
**Figure 1.** Prevalence of sleep complaints in the general population according to gender. 1 = subjects admitting to any sleep complaint. 2 = disorders of initiating and maintaining sleep. 3 = excessive daytime sleepiness. 4 = nightmares. *Difference in prevalence for gender pairs is significant to p<0.0001.

**Klink, M et al, Chest 1987**
FIGURE 2. Prevalence of sleep complaints in the general population according to age. *Prevalence of any complaint and DIMS increases significantly with increasing age (p value of trend <0.025). **No difference in prevalence of EDS between under 40 and 40 to 64 year old subjects, but significantly increased prevalence after age 64 (p<0.001).

Klink, M et al, Chest 1987
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Total population</th>
<th>DIMS(%)</th>
<th>EDS(%)</th>
<th>NM(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No respiratory disease</td>
<td>1867</td>
<td>35.6</td>
<td>10.6</td>
<td>7.1</td>
</tr>
<tr>
<td>Asthma alone</td>
<td>108</td>
<td>38.0</td>
<td>8.3</td>
<td>13.1</td>
</tr>
<tr>
<td>Chronic bronchitis alone</td>
<td>107</td>
<td>53.2*</td>
<td>26.2*</td>
<td>9.9</td>
</tr>
<tr>
<td>Chronic bronchitis with asthma</td>
<td>40</td>
<td>75.0*</td>
<td>25.2†</td>
<td>26.3‡</td>
</tr>
<tr>
<td>Emphysema</td>
<td>55</td>
<td>54.6‡</td>
<td>28.8*</td>
<td>14.0§</td>
</tr>
</tbody>
</table>

*Difference between no disease group and disease group significant to p<0.005.
†Difference significant to p = 0.06.
‡Difference significant to p < 0.01.
§Difference significant to p = 0.08.
||Difference significant to p < 0.05.
Table 1 – Prevalence of Sleep Complaints by Respiratory Symptoms

<table>
<thead>
<tr>
<th>Respiratory Symptoms*</th>
<th>No. of Subjects</th>
<th>DIMS</th>
<th>EDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1,358</td>
<td>28.0</td>
<td>9.4</td>
</tr>
<tr>
<td>1</td>
<td>443</td>
<td>39.1</td>
<td>12.4</td>
</tr>
<tr>
<td>2</td>
<td>299</td>
<td>52.8</td>
<td>22.8</td>
</tr>
</tbody>
</table>

Relation of Sleep Complaints to Respiratory Symptoms in a general population, Klink, M.E. et al, Chest 1994
### Table 3—Prevalence of Sleep Complaints Among Subjects Grouped by Percent Predicted Pulmonary Function

<table>
<thead>
<tr>
<th>Percent Predicted Pulmonary Function</th>
<th>No. of Subjects</th>
<th>Percent of Subjects With Sleep Disturbance*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DIMS</td>
</tr>
<tr>
<td>&lt;60</td>
<td>79</td>
<td>35.9</td>
</tr>
<tr>
<td>60-80</td>
<td>696</td>
<td>35.3</td>
</tr>
<tr>
<td>&gt;80</td>
<td>583</td>
<td>34.3</td>
</tr>
</tbody>
</table>

*Rates of sleep complaints did not vary significantly among pulmonary function groups (by M-H trend $\chi^2$). DIMS = difficulty initiating or maintaining sleep; EDS = excessive daytime sleepiness.
Relation of Sleep Complaints to Respiratory Symptoms in a general population, Klink, M.E. et al, Chest 1994
Mastronarde, JG et al, Sleep Quality in Asthma: Results of a large prospective clinical trial, Journal of Asthma, 2008
Mechanisms of sleep disturbances in asthma

- Circadian Variation
- Hormonal Change
- Nocturnal asthma symptoms
- GERD
- Medications
- Poor Sleep Quality
- DIMS
- Restlessness
- EDS

Mastronarde, JG et al, J of Asthma, 2008
Sleep Quality in Asthma (Mastronarde, JG et al, 2008)

- Mild-moderate asthmatics have substantial impairment in sleep quality
- Improved sleep quality resulted in better asthma control and quality of life but no improvement in pulmonary function
- Sleep quality was not affected by 6 months of treatment with low dose theophylline or monteleukast
- 10% prevalence of obstructive sleep apnea symptoms in women with asthma
FIGURE 1. Schematic diagram of the effects of sleep on respiration. In each case, sleep has a negative influence which has the overall impact of producing hypoventilation and/or hypoxemia and hypercapnia. V/Q = V/Q ratio.
COPD

- **Daytime Hypoxemia**
  - **↓ Sleep Efficiency**

- **↑ Age**
  - **↓ REM sleep**

- **↓ FEV1**
  - **↑ Arousal Index**

McSharry DG et al, Sleep Quality in COPD, Respirology, July 2012
Sleep and COPD

- 1 night’s sleep deprivation results in small transient falls in FVC and FEV1 (2)
- No association exists between mild COPD and obstructive sleep apnea (3)
- Sleep disturbance in COPD patients contributes to daytime EDS, fatigue, lethargy and impaired quality of life (4)

(3) Sanders MH et al, Sleep and sleep-disordered breathing in adults with predominantly mild obstructive airway disease, AJRCCM, Jan 1, 2003
Fig 1  Duration of sleep (left panel) and proportions of rapid eye movement (REM) and non-REM sleep and of wakefulness as percentages of total sleep period (right panel) in patients with chronic obstructive lung disease (open bars) and in two control groups of similar age previously reported by others. Controls reported by Williams et al\textsuperscript{29} (hatched bars) did not have respiration monitored during sleep whereas controls reported by Carskadon et al\textsuperscript{27} (stippled bars) had monitoring similar to that of our study group. Patients with chronic obstructive lung disease had a shorter sleep period and more intervening wakefulness than controls.
Fig 4  Relation between mean duration of episodes of uninterrupted sleep and discrete episodes of arterial desaturation ($SaO_2 \geq 4\%$ less than baseline $SaO_2$). Each point is one subject.
### TABLE 1. RESPIRATORY DISTURBANCE INDEX ACCORDING TO THE PRESENCE OR NOT OF OBSTRUCTIVE PULMONARY DISEASE

<table>
<thead>
<tr>
<th>Variables</th>
<th>Participants without COPD (FEV₁/FVC ≥ 70%) (N = 4,816)</th>
<th>Participants with COPD (FEV₁/FVC &lt; 70%) (N = 1,138)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDI: mean value ± SD</td>
<td>9.13 ± 12.59</td>
<td>7.49 ± 11.87*</td>
</tr>
<tr>
<td>RDI: median value (interquartile range)</td>
<td>4.51 (1.36, 11.59)</td>
<td>3.51 (1.35, 8.81)†</td>
</tr>
<tr>
<td>Participants with RDI &gt; 10/h (%)</td>
<td>28.86</td>
<td>22.32*</td>
</tr>
<tr>
<td>Participants with RDI &gt; 15/h (%)</td>
<td>18.63</td>
<td>13.97†</td>
</tr>
</tbody>
</table>

Sanders MH et al, AJRCCM, Jan 2003
Overlap Syndrome

- Prevalence of overlap syndrome between OSAS and COPD is 0.5%-1% in patients > 40 years of age (5)
- Quality of sleep is affected by OSAS and not by severity of airway obstruction in overlap syndrome (3)

(5) Weitzenblum E. et al, OSA in patients with COPD, Rev Mal Respir, Apr 2010
Sleep and COPD

• Low sleep quality in COPD is associated with low disease-specific and generic health related quality of life (6)
• Most COPD patients do not complain of excessive daytime sleepiness (6)

COPD and Asthma Sleep Impact Scale
(Pokrzywinski et al, Health Qual Life Outcomes, Dec. 2009)

- **During the past week how often did you:**
  - Have a bad night’s sleep?
  - Have problems staying awake during the day?
  - Have trouble falling asleep?
  - Wake up at night with breathing problems?
  - Wake up in the night and have trouble falling back asleep?
  - Have a good night’s sleep?
  - Wake up feeling rested?
Management of Insomnia in COPD

- Anticholinergics improve sleep quality and are less likely to worsen V/Q mismatch than sympathomimetics (7)
- Avoid drugs which are known to cause insomnia like theophylline and oral steroids
- Avoid benzodiazepines especially in hypercapneic patients (8)

(8) George CFP et al, Management of Insomnia in patients with COPD, Drugs, 2003
Management of Insomnia in COPD

- Tricyclic antidepressants and phenothiazines appear to be well tolerated from the respiratory standpoint (8)
- Zolpidem or Zaleplon may be better options for sleep maintenance
- Cognitive behavioral therapy for insomnia
- Avoid sedative-hypnotics during COPD exacerbations
Conclusion

• Sleep complaints are common in patients with chronic lung disease
• Sleep disturbances have a significant impact on the overall quality of life in patients with chronic lung disease
• Patients with chronic lung disease should be evaluated routinely for sleep complaints