

# The Epidemiology and Diagnosis of Insomnia

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## Abstract

Many questions remain unanswered with regard to our understanding of insomnia. Although it is generally believed that 10% to 15% of the adult population suffers from chronic insomnia, and an additional 25% to 35% have transient or occasional insomnia, prevalence estimates vary because of inconsistent definitions and diagnostic criteria. The elderly in particular are affected by insomnia, and it has been shown that women are more likely to have sleep difficulties than men. Although insomnia can be a primary condition, and can coexist with other disorders or be considered secondary to these disorders, the mechanisms producing it are not clearly defined. Additionally, the relationship between insomnia and other disease states is not always clear because it is often not possible to determine the cause-and-effect relationship between disorders. Epidemiologic studies show that abnormal sleep patterns predict lower life expectancy, and that people with insomnia are more likely to develop affective disorders, substance abuse, and other adverse health outcomes. This article will provide an overview of insomnia, its prevalence and epidemiology, and guidelines for clinical assessment.

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Sleep accounts for one third of human life, yet scientific inquiry in this area is limited compared with other aspects of neuroscience.<sup>1</sup> Additionally, studies suggest that poor sleep contributes to ill health. Epidemiologic studies show that abnormal sleep patterns predict lower life expectancy,<sup>2</sup> and that insomnia frequently co-occurs with affective disorders, substance abuse, and other physical and psychological comorbidities.<sup>3,4</sup> However, research into the relationships between these findings is sorely lacking.

The definition of insomnia is a complaint of disturbed sleep, manifested as difficulties in sleep initiation or sleep maintenance,

and/or as early awakenings. Many sources also add the presence of associated daytime impairments, such as fatigue, irritability, decreased memory and concentration, and pervasive malaise affecting many aspects of daytime functioning.<sup>5</sup> Although all definitions of insomnia rely on its symptomatic presentation, a standard diagnostic definition does not exist. Three separate texts present diagnostic criteria for insomnia: *The Diagnostic and Statistical Manual of Mental Disorders (DSM)*<sup>6</sup>; *The International Classification of Sleep Disorders*<sup>7</sup>; and *The ICD-10 Classification of Mental and Behavioural Disorders*.<sup>8</sup> Some definitions are based solely on reports of nocturnal sleep disturbances,<sup>9</sup> whereas others include features such as associated daytime impairment (eg, fatigue, irritability, or reduced memory or concentration),<sup>10</sup> self-reported sleep dissatisfaction,<sup>11</sup> or other criteria.<sup>6,12-15</sup>

Attempts have been made to subtype insomnia. One method is based on duration of symptoms, identifying insomnia as either chronic (long-term) or acute (transient). A 2005 National Institutes of Health (NIH) State-of-the-Science statement pointed out that time periods of various durations have been used to define chronic insomnia, ranging from 30 days to 6 months.<sup>5</sup> The transient/chronic distinction can be clinically relevant, inasmuch as transient insomnias often result from specific environmental or social events, such as shift work, death of a loved one, air travel, and noise, and may be more appropriately managed by addressing these stressors and by managing the insom-

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nia directly (and often prophylactically). On the other hand, chronic insomnia may be more often related to intrinsic sleep disorders, primary insomnia, or chronic medical and psychiatric conditions, and may require a more extensive evaluation (including assessment of comorbid conditions) in order to delineate appropriate treatment. However, it should be stressed that the relationships between insomnia duration, etiology, and evaluation implications have not been well investigated.

Insomnia can also be classified on the basis of etiology into primary and secondary subtypes. The term *primary* indicates that the insomnia is not caused by any known physical or mental condition but is characterized by a consistent set of symptoms, a defined disease course, and a general responsiveness to treatment.<sup>16,17</sup> Although the etiology of primary insomnia has yet to be clarified, recent research implicates endocrine, neurologic, and behavioral factors as contributing to its pathogenesis.<sup>18-20</sup> It is estimated that among patients diagnosed with insomnia, 25% to 30% suffer from primary insomnia.<sup>6,21</sup> *Secondary* insomnia, in contrast, has been defined historically as insomnia resulting from other medical and psychiatric illnesses, medication use, or other primary sleep disorders.<sup>5,22</sup> The 2005 NIH State-of-the-Science statement, however, has suggested the use of the term *comorbid insomnia*, instead of *secondary insomnia*, based on a limited level of understanding of the causal relationships which may exist between insomnia and coexisting disorders. Conceivably, primary insomnia could coexist as an independent entity in the context of another disorder, as opposed to being caused by it.<sup>5</sup>

### Epidemiology and Natural History of Insomnia

Estimates of the prevalence of insomnia are variable because definitions and diagnostic criteria for insomnia are inconsistent. In addition, the use of baseline and follow-up assessments to establish incidence and remission rates can be problematic because of the wide spectrum of insomnia duration (eg, a positive finding of insomnia at baseline and 1-year follow-up may reflect unremit-

ting chronic insomnia or 2 episodes of transient insomnia).<sup>23</sup> Given these limitations, it is generally believed that 10% to 15% of adults suffer from chronic insomnia,<sup>24</sup> usually regarded as a persistent insomnia lasting more than 1 month, and an additional one third have transient or occasional insomnia.<sup>25</sup>

The elderly in particular are affected, with an estimated prevalence ranging from 13% to 47%.<sup>22,26-31</sup> The National Institute on Aging's Established Populations for Epidemiologic Studies of the Elderly (EPESE) 3-year longitudinal study showed that 42% of community-dwelling seniors who participated in the survey had difficulty falling and staying asleep.<sup>26,32</sup> Sleep difficulties were more prevalent among seniors with physical disability, depressed mood, respiratory symptoms, or fair-to-poor perceived health and among those using anxiolytic and barbiturate prescription medication. At the 3-year follow-up of EPESE, Foley et al estimated incidence and remission rates for insomnia in more than 6000 participants of the original survey.<sup>32</sup> Among 4956 participants who had no symptoms of insomnia at baseline, nearly 15% reported symptoms at the 3-year follow-up, suggesting an annual incidence of 5%.

In the same study, for about 15% of participants, insomnia symptoms resolved each year. Extrapolating these findings to the general population, the authors estimated that 8 million elderly persons nationwide have insomnia on any given day, more than 1 million new cases of insomnia develop each year, and symptoms resolve in nearly 1.3 million elderly persons annually.<sup>32</sup> Disturbed sleep is also associated with impairments in memory and attention, and can be misinterpreted as signs of dementia in the elderly.<sup>33</sup>

Although most epidemiologic studies indicate that women are more likely to have sleep difficulties than men,<sup>27,34</sup> the EPESE study reported comparable rates in both sexes. The exception to this parity occurred in patients 85 years or older, in which the prevalence was higher among men.<sup>32</sup> The EPESE study also showed that women were less likely to achieve remission (46% of women vs 52% of men), suggesting the high-

er prevalence in women reported in other epidemiologic studies may indicate fewer remissions in women, not more new cases.<sup>32</sup> This hypothesis was supported by findings from the Cardiovascular Health Study of 2005, which reported that women with insomnia were less likely than men to remit.<sup>35</sup>

In addition to the EPESE study of elderly patients, several other longitudinal studies have helped clarify the natural history of chronic insomnia. Breslau et al conducted a baseline assessment and 3.5-year follow-up of 1200 young adults (aged 21-30 years) drawn randomly from a health maintenance organization database. The lifetime prevalence of insomnia in this population was 24.6% and was slightly higher in women than men (26.7% and 21.4%, respectively). The 3.5-year incidence of new insomnia among subjects with no insomnia at baseline was 14.8% for women and 10.6% for men; slightly less than the incidence rates reported in the EPESE study.<sup>36</sup>

In a study of 521 healthy middle-aged women near menopause presenting at a clinic, Owens and Matthews found a very high prevalence (42%) of self-reported sleep difficulties. Among those reporting sleep problems, the most prevalent complaint was awakening during the night (reported by 92%), followed by earlier-than-desired awakening (59%) and trouble falling asleep (49%). A cross-sectional analysis failed to identify significant associations between pre-, peri-, or postmenopausal status and general or specific sleep complaints. However, among the subset of women who were premenopausal at baseline and postmenopausal and not using hormone replacement therapy at follow-up, a higher proportion reported sleep difficulties at the postmenopausal than at the premenopausal assessment.<sup>37</sup>

Hohagen et al conducted a study of 2512 patients aged 18 to 65 years presenting to primary care clinics in Germany; a baseline assessment identified 18.7% with severe insomnia (*DSM-III-R* criteria), 12.2% with moderate insomnia (*DSM-III-R* criteria, without impairment of daytime functioning), and 15% with mild insomnia (occasional difficulties in initiating and maintaining sleep). Follow-up assessments were conducted in patients reporting baseline insomnia at

4 months and 2 years. At baseline, mild insomnia was more prevalent among men, but severe insomnia was more common among women by a nearly 2:1 margin (65% vs 35%). More than two thirds of patients with severe insomnia at baseline reported a disease duration of 1 year or more.<sup>38</sup>

At the 4-month follow-up, 75% of those reporting severe insomnia at baseline still reported severe or moderate insomnia, with the remainder reporting either mild symptoms or no symptoms. At 2 years, the persistence of severe or moderate insomnia was 52% among those with severe insomnia at baseline; 42% of these patients reported severe insomnia at all 3 visits.<sup>38</sup> Importantly, despite the overall persistence of sleep complaints among those with severe insomnia, a follow-up study revealed that the symptomatic presentation shifted significantly over time. For example, only half of those reporting exclusively sleep-onset difficulties at baseline did so at 4 months, and the persistence of sleep maintenance and early-awakening complaints was even lower. This symptomatic lability calls into doubt the utility of insomnia classifications based on time of night affected, at least among patients with severe insomnia.<sup>39</sup>

#### Clinical Correlates of Insomnia

The longitudinal studies described above have also provided insight into the clinical conditions commonly associated with insomnia. Among young adults, prevalent insomnia was associated most strongly with major depressive disorder (MDD), with an odds ratio (OR) for the presence of MDD of 16.6 among subjects with insomnia compared with those without insomnia; the OR was even higher (41.8) among subjects reporting both insomnia and hypersomnia. A number of other psychiatric conditions, including anxiety disorders (ORs, 2.4-7.0), substance abuse disorders (OR, ~2 for both alcohol and illicit substances), and nicotine dependence (OR, 2.8), were also highly correlated with insomnia.<sup>36</sup>

With regard to temporal patterns, a previous history of insomnia at baseline was strongly associated with the incidence of new psychiatric disorders, including MDD, anxiety disorders, substance abuse disorder,

and nicotine dependence. The association with subsequent MDD was attenuated when the presence of other depressive symptoms at baseline was taken into account.<sup>36</sup> However, a potential causative role for insomnia in the development of MDD has been postulated by several researchers.<sup>40,41</sup> Whether insomnia is a precursor to MDD, an early clinical hallmark of MDD, or the result of etiological factors common to MDD remains to be clarified.

Hohagen et al reported that severe and moderate insomnia, but not mild insomnia, were associated with (unspecified) chronic somatic disorders. In addition, when asked to rate their overall health status, patients with severe insomnia rated their health as “moderate” (60%) or “bad” (25%) far more frequently than those with no insomnia (41% and 4%, respectively).<sup>38</sup>

The same study also showed a strong correlation between insomnia severity and psychiatric comorbidities. Among those with severe insomnia, the prevalence of any psychiatric disorder was 37.4% and the prevalence of depression was 21.7%, compared with prevalence rates of 9.9% and 3.7%, respectively, for those reporting no sleep problems.<sup>38</sup>

In addition to the strong correlations between insomnia and psychiatric comorbidities, the prevalence of insomnia is increased relative to healthy controls in the context of several chronic medical conditions, including osteoarthritis<sup>42</sup>; rheumatoid arthritis<sup>43</sup>; coronary artery disease<sup>44,45</sup>; end-stage renal disease<sup>46</sup>; type 1 and type 2 diabetes mellitus<sup>47,48</sup>; and neurologic disorders, such as restless legs syndrome,<sup>49</sup> Parkinson’s disease,<sup>50</sup> and Alzheimer’s disease.<sup>51</sup> These associations and others are addressed in detail in the following article by Dr Ancoli-Israel (“The Impact and Prevalence of Chronic Insomnia and Other Sleep Disturbances Associated With Chronic Illness”).

### Clinical Assessment

Although more studies are necessary, evidence indicates that (1) insomnia may coexist with both psychological conditions and physical illness, and (2) left untreated, it may become a long-term, chronic condition, particularly in women. Early interven-

tion and management, therefore, could be beneficial. However, the proportion of insomnia patients who report insomnia to their physicians is quite small, and physicians may not adequately assess it.<sup>36,52</sup> Both patients and physicians may not recognize the impact of poor sleep on daily functioning and the risk of serious accidents and psychological sequelae.<sup>5</sup> Practice guidelines developed by the Standards of Practice Committee of the American Academy of Sleep Medicine strongly recommend routine clinical screening for symptoms of insomnia during health examinations so that treatment can be integrated into the patient’s overall care.<sup>53</sup>

As with every illness, the cornerstone of assessment for insomnia begins with a comprehensive history and screening for comorbidities, such as depressive and anxiety disorders, respiratory problems, and substance use, among others.<sup>54</sup> An in-depth sleep history is essential in identifying the cause of insomnia<sup>5</sup> and should include results of previous treatments.<sup>54</sup> Many of the tools that are useful in the assessment of insomnia are subjective questionnaires. Others include sleep logs, symptom checklists, psychological screening tests, and bed partner interviews.<sup>5</sup> The Pittsburgh Sleep Quality Index is a sleep questionnaire that may provide useful information about sleep quality, timing, and duration.<sup>55</sup> The Insomnia Severity Index (Figure) is a reliable and valid instrument to quantify perceived insomnia severity, including next-day consequences.<sup>56</sup> Nocturnal polysomnography and daytime multiple sleep latency testing are not recommended for the routine evaluation of insomnia unless other sleep disorders are suspected, such as sleep-related respiratory disturbances or periodic limb movement disorder.

### Conclusion

Many questions remain unanswered in our understanding of insomnia. Future research must clarify existing evidence surrounding the exact nature of the relationship between insomnia and psychological and physiologic comorbidities. In the absence of comprehensive knowledge about the active intricacies of the “resting” brain,

**Figure.** Insomnia Severity Index<sup>57</sup>

Please answer each of the questions below by circling the number that best describes your sleep patterns **in the past week**. Please answer all questions.

Please rate the current (past week's) <b>SEVERITY</b> of your insomnia problem(s):	None	Mild	Moderate	Severe	Very Severe
Difficulty falling asleep	0	1	2	3	4
Difficulty staying asleep	0	1	2	3	4
Problem waking up too early	0	1	2	3	4

  

How <b>SATISFIED/DISSATISFIED</b> are you with your current sleep pattern?	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
	0	1	2	3	4

  

To what extent do you consider your sleep problem to <b>INTERFERE</b> with your daily functioning (eg, daytime fatigue, ability to function at work/daily chores, concentration, memory, mood, etc)?	Not at all Interfering	A Little	Somewhat	Much	Very Much Interfering
	0	1	2	3	4

  

How <b>NOTICEABLE</b> to others do you think your sleeping problem is in terms of impairing the quality of your life?	Not at all Noticeable	A Little	Somewhat	Much	Very Much Noticeable
	0	1	2	3	4

  

How <b>WORRIED/DISTRESSED</b> are you about your current sleep problem?	Not at all Worried	A Little	Somewhat	Much	Very Much Worried
	0	1	2	3	4

  

Total: \_\_\_\_\_

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what is known about the high prevalence and socioeconomic burden of insomnia should encourage increased awareness of the prevalence of sleep disturbances and promote effective treatment strategies.

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