



## WHAT WE KNOW

# AD/HD, Sleep, and Sleep Disorders

**A**ttention-deficit/hyperactivity disorder (AD/HD) is a common neurobiological condition affecting 5-8 percent of school age children<sup>1,2,3,4,5,6,7</sup> with symptoms persisting into adulthood in as many as 60 percent of cases (i.e. approximately 4% of adults).<sup>8,9</sup>

Of all children with AD/HD, only about 30 percent of them have AD/HD as their only diagnosis. Two-thirds of children with AD/HD are reported to have at least one co-existing condition, and these conditions complicate the diagnosis and treatment of AD/HD.<sup>10,11</sup>

Any disorder can co-exist with AD/HD, but certain disorders seem to occur more commonly. These include: oppositional defiant and conduct disorders, anxiety, depression, tics and Tourette syndrome, substance abuse, sleep disorders and learning disabilities.<sup>12,13</sup>

The relationship between sleep and AD/HD is not a new one. At one time, sleep disturbances were included in the diagnostic criteria for AD/HD, but due to a lack of demonstrable evidence, sleep disturbances were removed from the *Diagnostic and Statistical Manual of Mental Disorders*, when its *Third Revised Edition* was published in 1980.<sup>14</sup>

This *What We Know* sheet:

- describes AD/HD and sleep problems
- discusses the diagnosis of sleep disorders in people with AD/HD
- describes the most common sleep disorders among persons with AD/HD

- provides information on causes of sleep problems in individuals with AD/HD
- offers ideas on suggestions to deal with sleep problems.

For an introduction to the diagnosis and treatment of AD/HD, see *What We Know #1: The Disorder Named AD/HD*.

### **AD/HD, SLEEP AND SLEEP PROBLEMS**

While sleep problems can affect anyone in the general population, there is a greater occurrence of these problems in people with AD/HD. One quarter to one half of parents of children with AD/HD report that their children suffer from a sleep problem, especially problems with falling asleep and staying asleep.<sup>15</sup> Parental reports actually indicate a two to threefold higher instance of sleep problems in children with AD/HD compared to control groups in research studies.<sup>16</sup> In addition to having difficulty falling and staying asleep, these problems also include greater activity during sleep, restless legs/periodic leg movements during sleep (PLMS), unstable sleep patterns, and greater sleepiness than other children during the daytime.<sup>17,18,19,20,21,22,23,24</sup>

Although largely anecdotal, studies have shown that a substantial number of children with AD/HD also have a primary sleep disorder that accounts for some portion of their behavioral difficulties.<sup>25</sup> Researchers also speculate that AD/HD is associated with *hypoarousal* (a state of increased sleepiness) rather than *hyperarousal*. This indicates that hyperactivity could be a coping mechanism to counteract the daytime sleepiness these children experience.<sup>26</sup> While the evidence has not been found strong enough for a causal relationship, excessive daytime sleepiness is believed to worsen the symptoms of AD/HD.<sup>27,28</sup>

In adults, there is the possibility of diagnostic confusion between narcolepsy, excessive daytime sleepiness of unknown origin (called idiopathic hypersomnia) and AD/HD in self-reporting questionnaires.<sup>29</sup> The overlap between symptoms of sleep disorders and AD/HD does lead to questions regarding the

possible misdiagnosis of both conditions in adults and how closely they are related.<sup>30</sup>

Screening for possible sleep problems should be part of the evaluation of every person with behavioral and/or academic problems, especially AD/HD. If a sleep problem is suspected, a thorough sleep history should be taken by the evaluating clinician. The history should include questions about the usual bedtime, time required to fall asleep, whether there are night awakenings, snoring, difficulty waking up, whether the person takes naps, and daytime drowsiness. Patients may be asked to fill out a sleep diary that records daily sleep behaviors for a number of weeks.

Not all people with AD/HD suffer from sleep problems, but because such difficulties can cause distress in people with AD/HD and their families, it is important to understand the nature of these problems and how they relate to AD/HD. In addition, identifying underlying differences in sleep patterns between children with AD/HD who suffer from sleep disorders and those who do not may help determine common causes of both sleep problems and AD/HD in those affected.<sup>31</sup>

### **DIAGNOSIS OF SLEEP DISORDERS IN PEOPLE WITH AD/HD**

When AD/HD is diagnosed, the diagnosing clinician must rule out other conditions as the source of the AD/HD symptoms, as well as determine whether there are any other psychiatric or neurological disorders present. Often, the same symptoms overlap in different disorders. The problem for the clinician is to discern whether a symptom belongs to AD/HD, to a different disorder, or to both disorders at the same time. For some individuals, the overlapping of symptoms can indicate the presence of multiple disorders.

Sleep disorders provide an especially difficult challenge, as many of the symptoms of sleep disorders can mimic AD/HD symptoms and may be exacerbated by AD/HD symptoms and medications used to treat AD/HD.<sup>32</sup>

By conducting a complete evaluation, a well-trained clinician familiar with AD/HD and other disorders will be able to discern between AD/HD and other possible

conditions. Interviews and questionnaires are part of the diagnostic process used to obtain information from the patient, the patient's family, and his or her teachers to screen for these other disorders.

Because sleep disorder symptoms can mimic AD/HD symptoms, such as difficulty with paying attention and concentrating, they can actually be misdiagnosed as AD/HD. Clinicians should be aware of the co-existence of Sleep Disordered Breathing (SDB) and Obstructive Sleep Apnea (OSA) with AD/HD when diagnosing and treating symptoms.<sup>33</sup> Some believe that many of the concerns that AD/HD is over diagnosed may be related to some parents and providers incorrectly attributing attention difficulties to AD/HD rather than to underlying sleep disorders.<sup>34</sup>

## COMMON SLEEP DISORDERS AMONG PEOPLE WITH AD/HD

**Restless Legs Syndrome.** One of the more frequent sleep disorders among individuals with AD/HD is Restless Legs Syndrome (RLS). Up to 24 percent of people with AD/HD may have RLS symptoms, and up to 26 percent of people suffering RLS may have AD/HD or symptoms of AD/HD. Daytime manifestations of RLS can mimic AD/HD symptoms, such as restlessness and inattention.<sup>35</sup> [For more information, see the National Institute of Neurological Disorders and Stroke (NINDS) fact sheet on RLS ([http://www.ninds.nih.gov/disorders/restless\\_legs/detail\\_restless\\_legs.htm](http://www.ninds.nih.gov/disorders/restless_legs/detail_restless_legs.htm)), or the Restless Legs Foundation at [www.rls.org](http://www.rls.org).]

**Sleep Disordered Breathing and Obstructive Sleep Apnea.** SDB and OSA are two more sleep disorders that may affect people with AD/HD.<sup>36</sup> SDB and OSA are believed to be more significant<sup>37</sup> in people with AD/HD than in the general population, and the sleep difficulties associated with these disorders can lead to AD/HD symptoms during the day. It is not clear if difficulties arising from SDB make existing AD/HD symptoms worse in general, or only in a subset of people with AD/HD.<sup>38</sup>

## CAUSES OF SLEEP PROBLEMS IN INDIVIDUALS WITH AD/HD

While there is a known and demonstrable link between AD/HD and sleep disorders, questions remain as to whether people with AD/HD have more intrinsic difficulties settling down at bedtime that are not related

to outside factors, co-existing conditions or sleep disorders. In other words, AD/HD itself may lead to difficulty sleeping.<sup>39</sup>

Most studies using objective measures such as actigraphy (in which a small wristwatch-like computer device measures body movements during sleep as well as sleep/wake periods and total duration of sleep) and infrared video cameras (which observe sleep behavior and record movements during sleep) have shown no significant differences in how sleep works between children with AD/HD and control groups. But certain characteristics do seem common across different studies.<sup>40</sup> Activity during sleep has been found to be higher in children with AD/HD in terms of the frequency and duration of movements. The instability of sleep patterns in children with AD/HD may indeed set them apart from control groups, according to one study, which suggested that this might reflect an impairment in arousal regulation in AD/HD. The result is that children with AD/HD might be sleepier than children without the disorder.<sup>41</sup> This study has been supported by subsequent studies, which have found that children with AD/HD exhibit excessive daytime sleepiness, high motor achievements in sleep, and significant Sleep Disordered Breathing. It was also found that there is no other significant difference in sleep patterns between children with AD/HD and those without.<sup>42</sup>

The cause of sleep problems in people with AD/HD is still largely unknown and further research into this area is needed to better understand the complex relationship between sleep and AD/HD.

Here are some specific causes of sleep problems that can impede sleep in children or adults with AD/HD.

**Bedtime resistance.** Children with AD/HD may have a great deal of difficulty settling down in the evening. Interruptions during bedtime routines can be more challenging when the child has AD/HD and parents often describe increased bedtime resistance and struggles.<sup>43</sup>

**Stimulants.** The caffeine found in coffee, tea, chocolate and many carbonated beverages has long been known to increase problems with sleep. In addition, the stimulant medications used to treat AD/HD can contribute to sleep disorders in people with AD/HD.<sup>44</sup>

**Co-existing conditions.** In addition to primary sleep disorders, sleep problems in persons with AD/HD can also be the result of common co-existing conditions. Anxiety and depression disorders can lead to difficulties

with sleeping, and are two conditions often found to exist with AD/HD.<sup>45</sup> Drug and alcohol abuse problems also have a negative impact on a person's ability to sleep properly.<sup>46</sup>

## DEALING WITH SLEEP PROBLEMS IN INDIVIDUALS WITH AD/HD

While there is no one specific recommended treatment for sleep problems in children or adults with AD/HD, the National Sleep Foundation (NSF) does offer tips to help adults and children sleep better. The following suggestions may help to accomplish a smoother transition from wakefulness to restful sleep.

- **Practice good sleep habits.** Maintain a regular bed and wake schedule, even on weekends; avoid all caffeine products after late afternoon; avoid nicotine and alcohol close to bedtime; use the bed for sleeping only and avoid having children watch television or videos before bedtime.<sup>47,48</sup>
- **Set up a realistic time for bed and stick to that schedule.** Behavioral techniques may be necessary to help children with AD/HD stay in bed when the decided time has arrived. Children with AD/HD do better with structure and knowing what to expect ahead of time.<sup>49</sup>
- **Pay attention to room environment.** Keep the bedroom dark, quiet, cool and comfortable for the best sleep. Minimize potential interruptions, such as outside noise – this can be done by using a fan or humidifier to create “white noise.”<sup>50,51</sup> Part of ensuring a sleep-friendly environment might also mean keeping televisions, computers, videogames and other electronic equipment out of the bedroom.
- **Get plenty of exercise during the day.** Exercise helps dissipate hyperactivity and feelings of restlessness in those with AD/HD.<sup>52,53,54</sup> However, exercising close to bedtime can make it more difficult to fall asleep, so exercise should be completed at least three hours before bedtime.<sup>55</sup>
- **Monitor eating times.** Eating heavily too close to bedtime can inhibit a good night's sleep.<sup>56</sup> However, because some children with AD/HD don't get enough calories throughout the day to maintain proper nutrition, a small snack close to bedtime can ease bedtime hunger pains and help maintain a healthy weight.
- **Establish a routine.** Adults benefit from a relaxing routine at the end of the day. This helps ease the transition from the activities of the day to the calm restfulness of sleep. This is also important for children, as they thrive on and need routines.<sup>57</sup>
- **If taking either prescription or over the counter medication, consult with a physician.** Different medications can have different effects on different people. Discuss any medication taken with a physician to determine if there are any side effects that could impact the quantity or quality of sleep.

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