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فوق تخصص روانپزشکی کودک و نوجوان  
هیات علمی دانشگاه علوم پزشکی گیلان

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مشکلات خواب در اختلال نقص توجه-بیش فعالی

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- Attention deficit hyperactivity disorder (ADHD) is a disorder that manifests in childhood with symptoms of inattention, hyperactivity, and impulsiveness
  - These symptoms can affect cognitive, academic, behavioral, emotional, and social functioning.
  - It is a common disorder, diagnosed in approximately 5 percent of children and adolescents

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- Sleep disturbances are common among children with ADHD.
  - The association is complex and most likely bidirectional
  - ADHD and its treatment appear to promote sleep disturbances, while disrupted or inadequate sleep can contribute to ADHD symptoms

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- Sleep disturbances have been reported in as many as 70 percent of children with ADHD,
  - although this rate varies widely depending upon the method and definitions used to measure the sleep problems

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- Most studies that document **subjective sleep complaints** utilize
  - sleep diaries,
  - brief screening questionnaires like the BEARS survey
  - Children's Sleep Habits Questionnaire (CSHQ) ,
  - Children's Sleep Behavior Scale (CSBS)
  - Pediatric Sleep Questionnaire Sleep-Related Breathing Disorders (PSQ-SRBD) Scale



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- In these studies, common sleep complaints include :
  - Bedtime resistance
  - Sleep-onset difficulties
  - Night awakenings
  - Difficulty with morning awakenings
  - Sleep-related breathing problems
  - Daytime sleepiness

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- difficulties with sleep maintenance,
  - increased nocturnal motor activity,
  - snoring, restless sleep,
  - parasomnias, delayed sleep-wake phase, short sleep time,

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- Objective sleep measures

- Other studies use objective measures to assess physiologic characteristics of sleep in children with ADHD,

- including polysomnography (PSG), actigraphy, and the multiple sleep latency test (MSLT).



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- Compared with a healthy population, sleep in children and adolescents with ADHD is more likely to have the following abnormalities
  - **Limb movements :**
  - Increased prevalence of restless legs syndrome (RLS), and the associated phenomenon of periodic limb movements of sleep, (PLMD)

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- Obstructive sleep apnea (OSA)
  - Increased prevalence of sleep-disordered breathing (increased apnea-hypopnea index) .
  - One systematic review reported OSA in 20 to 30 percent of children with ADHD, compared with approximately 3 percent in the general population

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- Reduced or disrupted sleep time
  - Increased sleep onset latency,
  - lower total sleep time, lower sleep efficiency,
  - more stage shifts per hour of sleep, and more time in stage N1 (light) sleep .
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- These associations are partly but not fully explained by other factors, such as age, sex, comorbidities, and adjustments to conditions in the sleep laboratory (sometimes known as the first-night effect)

# INSOMNIA

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- Bedtime resistance, night awakenings, difficulties falling asleep or remaining asleep are the main symptoms of insomnia in childhood.
- Difficulty falling asleep without caregiver intervention, for example, a parent sitting or lying next to the child, is also considered a feature of pediatric insomnia

# INSOMNIA

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- children with insomnia can display behavioral and cognitive problems, including sleepiness, tiredness, irritability, aggression, hyperactivity and social withdrawn
- children with psychiatric disorders or developmental delays, the prevalence of insomnia can be substantially higher
- 80% among children with autistic spectrum disorder have some difficulties sleeping



# OBSTRUCTIVE SLEEP APNEA

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- OSA is a well-known but still under recognized sleep disorder and should be suspected in any child who snores.
- The prevalence of OSA is 1% to 5% in the general pediatric population but likely much higher in obese children and children with medical or neurodevelopmental conditions and habitual snoring
- symptoms of OSA include chronic snoring, labored breathing, gasping, or choking during sleep, apneas (breathing pauses) witnessed by parents and/or frequent arousals in a child with chronic snoring.

# OBSTRUCTIVE SLEEP APNEA

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- Nocturnal enuresis often accompanies pediatric OSA.
- Excessive daytime sleepiness is less prominent in children than in adults, but children with OSA are prone to develop psychiatric symptoms mimicking ADHD, irritability, and behavioral problems
- . Chronic snoring and OSA should be routinely screened in children with ADHD

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- In children and adolescents, the upper airway obstruction is often secondary to enlarged tonsils and adenoids, but obesity, craniofacial and muscular abnormalities can also determine or worsen OSA.

# CIRCADIAN RHYTHM DISORDERS

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- circadian rhythms are one of main physiologic systems which regulate sleep–wake cycles.
- When the sleep and wake-up times occur earlier than socially expected, for example, 7 PM to 3 AM, the sleep phase is defined as “advanced.”
- when sleep and wake-up times occur later than socially expected, for example, 3 AM to 11 AM, the sleep phase is “delayed.”

# CIRCADIAN RHYTHM DISORDERS

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- ADHD may be associated with disruption of the circadian cycle
- In one study, children with ADHD-related insomnia in comparison with controls had delayed dim-light melatonin onset, indicating circadian phase delay



# RESTLESS LEGS SYNDROME

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- RLS is a neurologic disorder presenting with sensory-motor symptoms, usually creepy or crawling sensations in the extremities and an urge to move the legs usually relieved by movement.
- The sensations and the urge to move are more prominent or only present in the evening and are exacerbated by immobility, thus interfering with sleep initiation and maintenance
- approximately one-quarter of individuals with RLS have attention problems and conversely, 13% to 35% of individuals with ADHD meet criteria for RLS

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- Children with symptoms that suggest RLS should be evaluated for iron deficiency by serum ferritin.
  - . PLMD is diagnosed in a symptomatic child based on the finding of frequent periodic leg movements during PSG but no RLS or other sleep disorder to explain the symptoms; the disorder can be treated in a manner similar to RLS.

# EFFECTS OF ADHD MEDICATIONS ON SLEEP

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- ADHD medications are known to influence sleep characteristics in children and adolescents and may **delay sleep onset (sleep-onset insomnia) or disrupt sleep continuity (sleep-maintenance insomnia)**.
- Effects of stimulants on sleep vary considerably between individual patients and between different medications, depending on individual vulnerability, pharmacokinetic properties of the drug, and duration of

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- **Stimulant medications** – Stimulant medications such as methylphenidate tend to **delay sleep onset and/or to decrease total sleep time** in patients with ADHD depending on the dose schedule, type of formulation, and the patient's age.
  - a meta-analysis of controlled trials concluded that treatment with methylphenidate compared with placebo was associated with **longer sleep onset latency, lower total sleep time, and lower sleep efficiency (time spent sleeping/time in bed)**

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- Similar findings are reported for other stimulant medications such as dextroamphetamine and dextroamphetamine-amphetamine
  - In another study, an extended-release formulation of methylphenidate showed a small negative effect on sleep during the initial treatment phase, but this effect gradually resolved during the first two weeks of treatment . This finding suggests that the effects of stimulant medications on sleep may be transient and tend to resolve with longer duration of treatment



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- Paradoxically, in some children, sleep-onset insomnia could be related to insufficient stimulant medication effect in the evening, leading to inadequately controlled ADHD symptoms at bedtime.
  - In this case, the sleep problems emerge as the result of rebound effect (ie, waning effect of the afternoon dose of medication) rather than a direct effect of the psychostimulant itself. This mechanism is suggested by case reports in which some children with sleep-onset insomnia improve after adding a low evening dose of stimulant

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- **Nonstimulant medication** :Atomoxetine is a nonstimulant medication that is used as a first-line treatment for ADHD in selected patients
  - .Atomoxetine in comparison with stimulants generally has fewer adverse effects on sleep. In one study, parental reports indicated better sleep quality in children treated with atomoxetine compared with methylphenidate , an increase in somnolence was reported in 9.9 percent of participants

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Extended-release formulations of guanfacine and clonidine are selective alpha-2 adrenergic receptor agonists that are treatment options for ADHD and can be used as an adjunct to stimulant treatment or as monotherapy .

These drugs have sedating effects and may be helpful for patients with insomnia

# COMORBID PSYCHIATRIC DISORDERS

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- Children and adolescents with ADHD exhibit a high rate of coexisting psychiatric disorders, which may manifest as or contribute to sleep problems
- **Oppositional defiant disorder (ODD)** – Children with the hyperactive subtype of ADHD are at increased risk for developing ODD, which may manifest **with reluctance to follow rules at bedtime**. ODD is thought to be a consequence of the child's hyperactivity and impulsive response style, which is perpetuated by responses from adults

# COMORBID PSYCHIATRIC DISORDERS

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- **Anxiety disorders** – Separation anxiety may present with bedtime resistance/bed refusal or nocturnal anxiety with fear of being left alone and being attacked or kidnapped during sleep.
- Children with generalized anxiety disorder are also prone to the psychophysiologic subtype of chronic insomnia (also known as "conditioned" insomnia), which is characterized by anxiety specifically about falling or staying asleep.



# COMORBID PSYCHIATRIC DISORDERS

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- **Depression** – Children with ADHD are at increased risk for depressed mood, characterized by negative ruminating thoughts, which may lead to sleep-onset delay, nocturnal awakenings, and difficulty getting up in the morning.
- **Substance use** – Adolescents with newly diagnosed ADHD should be assessed for substance use/abuse . Substance use may complicate the clinical presentation of daily routines. Some substances such as alcohol and stimulants also have direct effects on insomnia.

# COMORBID PSYCHIATRIC DISORDERS

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- **bipolar disorder** often presents during adolescence, and sometimes in younger children, and may be initially misdiagnosed as ADHD.
- Symptoms may include an increased level of energy in the evening with reduced need for sleep. A distinguishing feature is that individuals with bipolar disorder are not distressed by their insomnia, whereas this is not the case for children with ADHD

# PATHOPHYSIOLOGY OF ASSOCIATIONS

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- The association between ADHD and sleep is complex.
- In some cases, the sleep problem may be caused or exacerbated by **environmental factors** (eg, poor sleep habits), **stimulant medications used to manage the ADHD**, or **psychiatric or medical comorbidities**.
- **disrupted or inadequate sleep** may result in tiredness and daytime behavioral difficulties with focused attention, learning, and impulse regulation, which may mimic or exacerbate ADHD symptom

# PATHOPHYSIOLOGY OF ASSOCIATIONS

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- In some cases, inadequate sleep may be the primary problem, leading a child to qualify for a diagnosis of ADHD even though the condition may be reversible by proper diagnosis and treatment of the underlying sleep issue.
- children undergoing evaluation for ADHD should have a focused clinical assessment for sleep-disturbance , as recommended by the American Academy of Pediatrics

# EVALUATION

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- In children with ADHD symptoms, particularly important components of the history include:
  - **Sleep habits** – Evaluate for healthy sleep practices, including whether the child gets an age-appropriate amount of sleep , variability in the sleep schedule, sleeping environment, and bedtime routines



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- **Behavioral contributors**

- Evaluate for environmental and behavioral factors that may contribute to the sleep problem, including problematic sleep-onset associations, inadequate limit-setting by parents/caregivers, or anxiety.

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- **primary sleep disorders**

- Screening for primary sleep disorders is recommended for all children undergoing evaluation for ADHD

- identification and treatment for a primary sleep disorder may reduce or even eliminate the ADHD symptoms because sleep disturbances can mimic or exacerbate ADHD symptoms

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- **Circadian rhythm disturbances**

- To assess this factor, determine the child's sleep and wake schedule, whether it is regular, and whether it causes difficulties for the child and family (eg, problems with sleep onset or difficulty waking for school).
- For children with a significantly delayed sleep onset or inconsistent sleep schedule, a two-week sleep log with or without actigraphy can be helpful in defining circadian rhythm disturbances and designing an intervention

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- Medications

- Assess for medications that may affect sleep, including stimulants used to treat the ADHD and any psychoactive drugs.
- Careful documentation of each medication, dose, and timing is important to determine potential effects on sleep and inform decisions about medication management

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- **Sleep-disordered breathing**
  - Children with these symptoms should be evaluated in the sleep laboratory with overnight PSG.
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  - Referral to a specialist (ear, nose, and throat [ENT], sleep medicine, or allergy/immunology) may be indicated for additional evaluation and treatment.



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- **RLS**
  - should be evaluated for iron deficiency by serum ferritin.
  - Children with serum ferritin <50 ng/mL may benefit from treatment with iron supplements.
  - **PLMD** is diagnosed in a symptomatic child based on the finding of frequent periodic leg movements during PSG but no RLS or other sleep disorder to explain the symptoms; the disorder can be treated in a manner similar to RLS.