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DERLEME | REVIEW

Pediatric Sleep-Wake Disorders: A Review of Clinical Presentations, Comorbidities, and Management Approaches

Çocukluk Çağı Uyku-Uyanıklık Bozuklukları: Klinik Sunumlar, Komorbiditeler ve Yönetim Yaklaşımlarının Gözden Geçirilmesi

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Abstract
Sleep is a fundamental neurobiological process for optimal brain function. In recent years, sleep-wake disorders in children and adolescents have received increasing attention due to their significant impact on physical health, cognitive development, and emotional well-being. These disorders, including insomnia, obstructive sleep apnea, restless legs syndrome, and narcolepsy, present in diverse ways and pose considerable challenges in terms of both diagnosis and treatment. Despite growing research interest, such conditions remain under-recognized and frequently overlooked in pediatric populations. The etiology is multifactorial, often involving behavioral, environmental, developmental, and neurobiological factors. Sleep disturbances in children can lead to impaired academic performance, mood dysregulation, hyperactivity, and family stress. Diagnosis requires a thorough clinical evaluation, including sleep history, parental reports, and, when necessary, actigraphy or polysomnography. Management is typically multidisciplinary, pharmacologic therapy is reserved for moderate to severe cases, when non-pharmacological approaches are insufficient or in the presence of specific underlying conditions. This review provides a comprehensive overview of the pathophysiology, prevalence, classification, diagnostic challenges, and treatment strategies associated with sleep-wake disorders in children and adolescents. The aim is to enhance early recognition, clarify distinctions between normal variations, problematic behaviors, and diagnosable disorders, and highlight the potential long-term consequences of untreated sleep disturbances.
Keywords: Sleep disorders, insomnia, child, adolescent

Öz
Uyku, optimal beyin fonksiyonu için gerekli olan temel bir nörobiyolojik süreçtir. Son yıllarda çocuklarda ve ergenlerde uyku-uyanıklık bozuklukları, fiziksel sağlık, bilişsel gelişim ve duygusal refah üzerindeki önemli etkileri nedeniyle giderek daha fazla ilgi görmeye başlamıştır. Uykusuzluk, obstrüktif uyku apnesi, huzursuz bacak sendromu ve narkolepsiyi de içeren bu bozukluklar farklı şekillerde ortaya çıkmakta ve hem tanı hem de tedavi açısından önemli zorluklar yaratmaktadır. Artan araştırma ilgisine rağmen, bu tür durumlar pediatrik popülasyonda yeterince tanınmamakta ve sıklıkla gözden kaçırılmaktadır. Etiyoloji multifaktöriyeldir ve genellikle davranışsal, çevresel, gelişimsel ve nörobiyolojik faktörleri içerir. Çocuklarda uyku bozuklukları, akademik performansta bozulmaya, duygudurum düzensizliğine, hiperaktiviteye ve aile stresine yol açabilir. Tanı, uyku öyküsü, ebeveyn raporları ve gerektiğinde aktigrafi veya polisomnografi içeren kapsamlı bir klinik değerlendirme gerektirir. Tedavi genellikle çok disiplinlidir, farmakolojik tedavi, farmakolojik olmayan yaklaşımların yetersiz kaldığı veya belirli altta yatan durumların varlığında, orta ila şiddetli vakalar için saklı tutulmaktadır. Bu derleme, çocuk ve ergenlerde uyku-uyanıklık bozuklukları ile ilişkili patofizyoloji, prevalans, sınıflandırma, tanısal zorluklar ve tedavi stratejileri hakkında kapsamlı bir genel bakış sunmaktadır. Amaç, erken tanıyı geliştirmek, normal varyasyonlar, problemli davranışlar ve teşhis edilebilir bozukluklar arasındaki ayrımları netleştirmek ve tedavi edilmeyen uyku bozukluklarının potansiyel uzun vadeli sonuçlarını vurgulamaktır.
Anahtar kelimeler: Uyku bozuklukları, uykusuzluk, çocuk, ergen

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Introduction

Sleep is essential for our survival and well-being, and it's crucial for the developing brain during early childhood. Sleep-related disorders in children can significantly impact children's physical, emotional, and cognitive development and constitute a major source of parental concern (Goel et al., 2009; Cohen et al., 2024). Recent research has emphasized the complexity of these disorders, with a range of etiological factors, including genetic, environmental, and socio-behavioral influences. Sleep disturbances in youth can have profound effects on attention, mood regulation, learning, and social functioning (Goel et al., 2009; Beebe, 2011; Carter et al., 2014).

This review provides a comprehensive overview of the pathophysiology, prevalence, classification, diagnostic challenges, and treatment strategies associated with sleep-wake disorders in children and adolescents. The aim is to enhance early recognition, clarify distinctions between normal variations, problematic behaviors, and diagnosable disorders, and highlight the potential long-term consequences of untreated sleep disturbances.

Sleep Cycle

The biological rhythm of sleep and waking is regulated through both circadian and homeostatic processes (Goel et al., 2009; Lokhandwala & Spencer, 2022). Sleep is characterized by an intrinsic rhythmic organization known as sleep architecture, which comprises cyclical transitions between rapid eye movement (REM) and non-rapid eye movement (NREM) sleep (Yasugaki et al., 2025). Arousal and sleep (REM and NREM) are active and complex neurophysiologic processes, involving both neural pathway activation and suppression. These physiologic processes change over the life course, especially in the first 5 years (Bathory & Tomopoulos, 2017; Holst & Landolt, 2018; Hobson et al., 2021; Lokhandwala & Spencer, 2022).

REM sleep is closely associated with dreaming, as it is marked by an activated electroencephalogram (EEG) pattern resembling wakefulness (Yasugaki et al., 2025). This stage is also characterized by a loss of muscle tone and periodic rapid eye movements, along with irregular fluctuations in heart rate, respiratory rate, and depth (Peever & Fuller, 2017). Except for the eye and respiratory muscles, most skeletal muscles experience atonia. Despite this muscle paralysis, the brain remains highly active, and significant information processing occurs during this stage. A typical REM period lasts approximately 10-60 minutes, although its duration may vary depending on age and the presence of certain disorders (Colten & Altevogt, 2006). For example, REM sleep constitutes about 50% of total sleep time in infants, compared to 20–25% in adults (Kotagal, 2017; Vestergaard et al., 2024). In psychiatric disorders such as depression or psychosis, REM latency is often markedly shortened (Yasugaki et al., 2025).

In contrast, NREM sleep corresponds to traditional conceptions of sleep as a state of diminished physiological and psychological activity. It accounts for approximately 75–80% of total sleep time (Yasugaki et al., 2025) and is divided into three stages: N1, N2, and N3. Stages N1 and N2 are considered light sleep. N1 represents the transition from wakefulness to sleep and comprises about 5% of total sleep time, while N2, characterized by distinct EEG waveforms such as sleep spindles and K-complexes, accounts for approximately 50%. N3, or slow-wave sleep, is the deepest stage, comprising about 20% of total sleep time. During this phase, individuals are difficult to awaken, and physiological parameters such as heart rate, respiratory rate, and metabolic activity are significantly reduced. This stage is essential for physical and mental restoration (Colten & Altevogt, 2006; Lokhandwala & Spencer, 2022).

Sleep-wake states change dramatically across the lifespan, not only in the amount of sleep but in its ultradian and circadian timing. The full-term newborn infant may average about 16 hours of sleep per day, of which about 50 percent is REM sleep (Carskadon et al., 2004; Kotagal, 2017) In infants, the duration of individual REM sleep cycles is relatively shorter than in adults, and their sleep-wake patterns are polyphasic, consisting of multiple brief episodes of sleep and wakefulness distributed throughout the 24-hour day (Kotagal, 2017). During the first months of life, sleep-wake cycles gradually change as sleep at night and wakefulness by day become consolidated, although napping may continue into childhood (Panossian & Avidan, 2009; Galland et al., 2012; Mason et al., 2021). By age 3 or 4, the percentage of REM sleep falls to adult levels of about 20 to 25 percent and remains in this range for the rest of the individual's life (Galland et al., 2012; Lokhandwala & Spencer, 2022) Nevertheless, REM latency tends to decrease and length of the first REM period tends to increase in later life as stages 3 and 4 sleep decline (Gaudreau et al., 2001). The amount of time spent in delta sleep (stages 3 and 4) each night peaks in early adolescence (George & Davis, 2013) and gradually falls with age until it nearly disappears at about the age of 60 (Chaput et al., 2020). Young adults typically spend about 15 to 20 percent of total sleep time in delta sleep (Cohen et al., 2024).

Prevalence and Impact

Sleep disturbances are alarmingly common in children and adolescents, with studies indicating that approximately 25-40% of children experience some form of sleep problem (Dahl, 1996). In adolescents, the prevalence may be even higher, particularly with disorders such as insomnia, delayed sleep-wake phase disorder (DSWPD), and obstructive sleep apnea (OSA). These disturbances can have far-reaching consequences. Inadequate sleep in youth has been linked to academic underperformance, mood disorders, impaired cognitive function, and an increased risk of developing chronic conditions such as obesity and hypertension (Goel et al., 2009; Beebe, 2011; de Zambotti et al., 2018).

In the first year of a child's life, sleep-related rhythmic movements (Lam N & Veeravigrom M, 2023), nighttime awakenings are usually seen (Cohen et al., 2024). The most common sleep problems in children aged 1-5 years are bedtime problems, night waking, sleep-related rhythmic movements, night fears (Cohen et al., 2024), nightmares, parasomnias (sleep terrors), and OSA (Carter et al., 2014). Between the ages of 6 and 12, parasomnias (sleep terrors, sleepwalking), bruxism, enuresis, sleep apnea, unhealthy sleep habits, and Restless Legs Syndrome (RLS) are frequently seen (Galland et al., 2012). Lastly, in adolescents, the incidence of insufficient sleep, insomnia, sleep apnea, RLS, narcolepsy, and hypersomnolence disorders increases (Moturi & Avis, 2010; Hirshkowitz, 2004).

One of the most common sleep-wake disorders in adolescents is insomnia, characterized by difficulty initiating or maintaining sleep. This condition usually co-occurs with other psychiatric conditions such as anxiety and depression (Morin et al., 1994). Likewise, sleep apnea, especially OSA, is a prevalent disorder in children, contributing to daytime fatigue, behavioral problems, and cognitive impairments (Bitners & Arens, 2020). A particularly challenging issue in adolescent populations is DSWPD, where a delayed sleep onset and wake time prevent children from maintaining a healthy daily routine, often exacerbated by the pressures of school schedules (Narala et al., 2024) (Table 1).

Pathophysiology

The pathophysiology of sleep-wake disorders in youth varies depending on the specific condition. Insomnia is often associated with hyperarousal, where heightened anxiety or stress interferes with the body's ability to transition into sleep. In contrast, conditions like sleep apnea are linked to physical obstructions of the upper airway, which disrupt normal sleep patterns and lead to frequent arousals throughout the night (Marcus, 2001). In DSWPD, the biological clock appears to be misaligned with the societal clock, and while the underlying mechanisms remain unclear, genetic predispositions and circadian rhythm disturbances are thought to contribute (Chokroverty, 2010).

The link between sleep disorders and mental health is also well-established. Disrupted sleep can act as both a cause and a consequence of psychiatric disorders, with one exacerbating the other in a vicious cycle (Wheaton et al., 2016). Chronic sleep deprivation in adolescents has been shown to increase the risk of developing mood disorders, anxiety, and even suicidal ideation (Chung et al., 2008; Goel et al., 2009; Beebe, 2011).

Sleep-Wake Disorders

Sleep-wake disorders encompass 10 disorders or disorder groups: insomnia disorder, hypersomnolence disorder, narcolepsy, breathing-related sleep disorders, circadian rhythm sleep-wake disorders, NREM sleep arousal disorders, nightmare disorder, REM sleep behavior disorder, RLS, and substance/medication-induced sleep disorder (During & Kushida, 2019; DSM 5). Individuals with these disorders typically present with sleep-wake complaints of dissatisfaction regarding the quality, timing, and amount of sleep. Resulting daytime distress and impairment are core features shared by all of the sleep-wake disorders (Stores, 2003; DSM 5).

Insomnia Disorder

Insomnia is one of the most common pediatric sleep disorders. It is characterized by difficulty falling asleep, staying asleep, or waking too early, despite having an adequate opportunity to sleep (Cohen et al., 2024). Around 10-40% children and adolescents experience insomnia. It can cause daytime fatigue, irritability, mood disturbances, and impaired cognitive function. In children, insomnia is often behaviorally driven, with common causes including poor sleep hygiene, inconsistent bedtimes, and anxiety. Studies indicate that insomnia may be a precursor to mood disorders or attention problems in children and adolescents (de Zambotti et al., 2018; Delahoyde et al., 2024).

It is developmentally appropriate for some degree of transient bedtime resistance or insomnia to occur in children. The symptoms must occur at least 3 times per week for 3 months and affect the functioning of the child, parents, or family to be called insomnia disorder (Smith et al., 2023; Cohen et al., 2024). Importantly, evidence indicates that insomnia tends to be chronic. 88% of adolescents with a history of insomnia continue to experience symptoms. Therefore, insomnia in children is an important problem to address (de Zambotti et al., 2018; Delahoyde et al., 2024).

Circadian Rhythm Sleep-wake Disorder (CRSWD)

CRSWDs are characterized by a misalignment between the body's internal biological clock and the external environment. The most common CRSWD in adolescents is DSWPD (Mantle et al., 2020), which is characterized by difficulty falling asleep and waking up at socially acceptable times (Carter et al., 2014). It affects 1-16% of adolescents and is often linked with academic difficulties, social isolation, and an increased risk of mood disorders (Mantle et al., 2020; Steele et al., 2021).

Sleep Related Breathing Disorders (SRBD)

SRBDs are OSA, Central Sleep Apnea, and Sleep-Related Hypoventilation. Particularly, OSA is prevalent in children, especially those with obesity, enlarged tonsils/adenoids, or craniofacial abnormalities (Kotagal, 2017). Apnea typically lasts 10 to 30 seconds (Panossian & Avidan, 2009). Symptoms include loud snoring, gasping, restless sleep, and frequent awakenings. 1-5% of children suffer from OSA (Carter et al., 2014), and it is accompanied by behavioral problems, hyperactivity, and daytime sleepiness. Untreated OSA can lead to cardiovascular complications, impaired growth, and neurocognitive deficits (Marcus, 2001; Goel et al., 2009; Marcus et al., 2012).

Children younger than 5 years more often present with nighttime symptoms, such as observed apneas or labored breathing, than with behavioral symptoms (i.e., the nighttime symptoms are more noticeable and more often bring the child to clinical attention). In children older than 5 years, daytime symptoms such as sleepiness and behavioral problems (e.g., impulsivity and hyperactivity), Attention-Deficit/Hyperactivity Disorder (ADHD), learning difficulties, and morning headaches are more often the focus of concern (Trosman & Trosman, 2017).

Hypersomnolence Disorder

Hypersomnolence disorder is less common in children, it is more frequently diagnosed during adolescence. It can cause excessive daytime sleepiness despite adequate sleep duration, prolonged nocturnal sleep episodes, and difficulty waking. For differentiated diagnosis, the clinician must exclude narcolepsy, depression, or medication side effects. Young depressed patients, especially those with bipolar tendencies, often exhibit excessive sleep and have difficulty getting up in the morning (Parker et al., 2006).

Narcolepsy

Narcolepsy typically begins in adolescence or young adulthood. Misdiagnosis as laziness or behavioral problems for narcolepsy is quite common (Gupta et al., 2017). Symptoms include recurrent episodes of irrepressible need to sleep, excessive daytime sleepiness, cataplexy (sudden loss of muscle tone), hypnagogic hallucinations, hypocretin deficiency, REM sleep abnormalities (e.g., sleep-onset REM), and sleep paralysis (Panossian & Avidan, 2009). The main symptom is daytime sleepiness (Kotagal, 2017), and it affects academic performance and may cause behavioral problems. Cataplexy is the most specific symptom of narcolepsy and it is seen in 60-75% of pediatric cases (Kotagal, 2017). Consciousness is preserved, and loss of muscle tone occurs symmetrically in the extremities (Babiker & Prasad, 2015; Quaedackers et al., 2021).

Parasomnia Disorders

Parasomnias include abnormal behaviors that occur during sleep, such as sleepwalking, night terrors, and nightmares (Kotagal, 2017). These behaviors are more common in younger children and typically resolve with age. While often benign, parasomnias can cause injury, distress, or family disruption, especially if recurrent. NREM parasomnias are common and typically outgrown; nightmares may signal anxiety or trauma (Bruni et al., 2021).

Parasomnias include: NREM Sleep Arousal Disorders (e.g., sleepwalking, night terrors), Nightmare Disorder, REM Sleep Behavior Disorder (rare in children) (DSM-5).

Sleepwalking

Sleepwalking occurs in 10-30% of children at some point during childhood. It is associated with slow-wave sleep. In its most extreme form, it consists of ambulating during sleep (somnambulism). However, many types of complex behaviors arising from slow-wave sleep are typically regarded as sleepwalking. Because it arises from slow-wave sleep, the patient is difficult to awaken, confused, and amnestic. Sleep talking may also occur (Remulla & Guilleminault, 2004; Kotagal, 2017; Ekambaram & Maski, 2017; Mainieri et al., 2023).

Night Terrors

Night terrors affect 3-6% of preschool-aged children. Sleep terrors are characterized by a sudden arousal from slow-wave sleep with a piercing scream or cry and are accompanied by autonomic and behavioral manifestations of intense fear (Olejniczak et al., 2004).

Sleep terrors occur in 3 percent of children and less than 1 percent of adults. Children have higher percentages of slow-wave sleep than adults. Furthermore, during childhood, delta EEG activity has greater amplitude and is more hypersynchronous. Night terrors are not dreamlike, and usually there is no memory of what provoked the fright; however, fragments of brief, vivid images may be reported. After awakening from a sleep terror, a patient is usually unresponsive to stimuli, confused, or disoriented (Cohen et al., 2024). Vocalizations are usually incoherent. Fever, sleep deprivation, and central nervous system depressants may potentiate sleep terror episodes. In children, sleep terrors are not associated with psychopathology; conversely, adults often have a positive psychiatric history. Severity ranges from less than once per month to almost nightly occurrence (with injury to patient or others) (Ekambaram & Maski, 2017; Kotagal, 2017; Leung et al., 2020).

Nightmare Disorder

Nightmares are vivid, intense, and distressing dreams that occur during REM sleep and often provoke significant anxiety. They frequently awaken children and adolescents, leaving them fearful and in need of reassurance (Cohen et al., 2024). These dreams are typically complex and tend to become increasingly frightening as they progress, usually culminating in abrupt awakening. Since nightmares are REM sleep-related and terminate with arousal, the individual typically retains a clear memory of the dream content. Unlike sleep terrors, nightmares are rarely accompanied by behaviors such as talking, screaming, sleepwalking, or physical movements (Kotagal, 2017).

Occasional nightmares are reported in approximately 10% to 50% of children aged 3 to 6 years, while about 1% of adults experience nightmares on a weekly or more frequent basis. Although nightmares may also occur in children under the age of 3, their limited verbal abilities can hinder accurate reporting and lead to parental misinterpretation of the experience. A subset of individuals continues to experience nightmares into adolescence and adulthood; however, the overall prevalence of nightmares generally declines with age (Cohen et al., 2024).

The severity of nightmares can vary widely, ranging from infrequent episodes (less than once per week) with minimal psychosocial impact to persistent, nightly occurrences that significantly impair daytime functioning and quality of life (Stefani & Högl, 2021).

Sleep-Related Movement Disorders (SRMD)

SRMDs include RLS and Periodic Limb Movement Disorder (PLMD). The American Academy of Sleep Medicine has indicated bruxism as also a sleep-related movement disorder (Sateia, 2014). These disorders can significantly disrupt sleep and are often associated with other conditions, such as ADHD or iron deficiency (Khatwa & Kothare, 2010; Rémi et al., 2019; Trosman & Ivanenko, 2021). RLS and PLMD represent two overlapping disorders that often lead to sleep fragmentation and excessive daytime sleepiness. Recent reports indicate that children with ADHD or with conduct problems have a higher incidence of RLS and PLMD (Goel et al., 2009).

Restless Legs Syndrome

Approximately 1-2% of children are affected by RLS, with higher rates in adolescents. Symptoms of RLS include an irresistible urge to move the legs, particularly at rest or during sleep. It is a sensorimotor disorder characterized by an intense urge and compulsion to move the extremities, often occurring during sleep-wake transitions and not specific to any particular period of sleep. It is accompanied by, or in response to, uncomfortable, unpleasant sensations in the extremities. While its etiology is not fully understood, it is thought that iron deficiency may be a contributing factor (Picchietti & Picchietti, 2008; Kotagal, 2017).

RLS can result in insomnia, poor sleep quality, and attention problems. It is thought that there is a strong link between ADHD and RLS, and this link might be related to impairment in the dopaminergic system (Goel et al., 2009; Rémi et al., 2019; Trosman & Ivanenko, 2021).

Periodic Limb Movement Disorder

PLMD involves repetitive limb movements during sleep and can cause sleep fragmentation (Khatwa & Kothare, 2010). PLMS are brief jerks during sleep lasting between 0.5 to 5.0 seconds, and are more common in the legs, feet, and toes than in the arms. Patients are usually unaware of their own PLMS and of the associated arousals disturbing sleep (Picchietti & Picchietti, 2008).

Bruxism

Bruxism is a repetitive masticatory muscle activity, which is a risk factor for several serious health complications. It is characterized by clenching, tooth grinding, and/or bracing or thrusting of the mandible with circadian symptoms (such as facial tightness, head and neck pain, and insomnia) (Castroflorio et al., 2015). Sleep disorders comorbid with bruxism include OSA, parasomnias, RLS, mandibular myoclonus, and REM disorders (Bulanda et al., 2021; Cohen et al., 2024).

Sleep-Wake Disorders in Children with Special Needs

Psychological trauma and mental illness in children can significantly disrupt normal sleep patterns. Managing sleep-wake disorders is already challenging in the pediatric population; however, these difficulties are often compounded in children with special needs. In conditions such as autism or ADHD, the diagnosis and treatment of co-occurring sleep disturbances present additional complexities, placing greater strain on both the child and their caregivers.

Managing sleep-wake disorders in children with special needs requires a comprehensive, individualized approach. Interventions can be broadly categorized into behavioral, pharmacological, and environmental strategies.

Children with post-traumatic stress disorder may deliberately avoid sleep in an effort to prevent the re-experiencing of traumatic events through distressing dreams, often triggered by incidents such as accidents, surgeries, abuse, or the loss of a loved one. Even seemingly less severe stressors, such as witnessing or hearing an unintentional intrusion into the home, can lead to significant sleep disturbances. Children who have experienced physical or sexual abuse or neglect frequently exhibit disrupted sleep patterns, including shortened sleep latency, increased nighttime awakenings, reduced total sleep duration, and diminished REM sleep (Caldwell & Redeker, 2005).

Autism Spectrum Disorder (ASD)

Children with neurodevelopmental disorders frequently report subjective sleep difficulties, most commonly insomnia and reduced sleep duration (Cohen et al., 2024). Unlike their typically developing peers, these sleep disturbances often persist over time and show limited improvement with age. Parasomnias, such as sleepwalking, and SRMDs, including bruxism, appear to be more prevalent in this population. Additionally, there may be an increased incidence of REM sleep behavior disorder, a rare condition in childhood characterized by the absence of muscle atonia during REM sleep, which can lead to the physical enactment of dream content (Meltzer & Mindell, 2006). Behavioral interventions are considered the first-line treatment for sleep disturbances in children with ASD (Blackmer & Feinstein, 2016; Moore et al., 2017; Papadopoulos et al., 2019). These approaches may be supplemented with melatonin therapy; however, potential side effects and the limited availability of long-term safety data should be carefully discussed with caregivers (Cohen et al., 2024).

Attention Deficit Hyperactivity Disorder

ADHD involves dysfunction in brain regions such as the dorsolateral and ventrolateral prefrontal cortices and the dorsal anterior cingulate cortex, areas known to be particularly sensitive to sleep deprivation. Genetic studies have also highlighted the role of the catecholaminergic system in both ADHD pathophysiology and sleep regulation. Sleep disturbances are highly prevalent in this population, affecting up to 70% of children with ADHD. Common problems include behaviorally based insomnia (such as limit-setting disorder), bedtime resistance, delayed sleep onset, dim light melatonin onset delay, reduced total sleep duration, frequent nighttime awakenings, excessive daytime sleepiness, SRBDs, and comorbid SRMDs such as RLS and PLMD (Meltzer & Mindell, 2006; Goel et al., 2009; Sciberras et al., 2011; Slater & Steier, 2012; Langberg et al., 2014).

Sleep disturbances in children with ADHD may also arise from co-occurring psychiatric conditions or as side effects of stimulant medications, which can contribute to delayed sleep onset and shorter sleep duration. In a longitudinal study involving 195 children aged 5 to 13 years with ADHD, sleep problems were observed to be variable over a 12-month period in 60% of the sample, with most cases being transient; however, a persistent sleep disturbance was identified in approximately 10% of the children (Ogundele & Yemula, 2022). Notably, conditions such as OSA and RLS appear to be more common in children with ADHD, and addressing these sleep disorders may help alleviate core ADHD symptoms, potentially reducing the need for pharmacological treatment with psychostimulants (Domínguez-Ortega & de Vicente-Colomina, 2006).

Anxiety and Depression

Depression can cause sleep disturbances such as difficulty falling asleep, frequent awakenings, or early morning awakenings. The development of depression contributes to sleep disturbances and vice versa. Insufficient sleep can be stressful, and the accumulation of stress leads to the deterioration of mental health and contributes to the development of psychiatric disorders. Thus, it is likely that depression and sleep are bidirectionally related (Yasugaki et al., 2025). Among children and adolescents diagnosed with depressive disorders, insomnia symptoms, reported by more than half of the sample, have been associated with increased severity of specific depressive features, including fatigue, suicidal ideation, somatic complaints, and impaired concentration (Asarnow & Manber, 2019). Similarly, among young adults with depressive symptoms, those reporting sleep disturbance had more anxiety symptoms than those without sleep disturbance. Sleep deprivation has a strong effect on the risk for major depression (Roberts & Duong, 2014). Hypersomnolence, or sleeping too much, also is a common complaint in depressed adolescents (Meltzer & Mindell, 2006).

Children and adolescents with co-occurring mood symptoms and sleep disturbances often exhibit more severe depressive symptomatology, elevated rates of self-harm and suicidality, and reduced responsiveness to standard treatments for depression. Even when therapeutic interventions for depressive or bipolar disorders are effective in alleviating mood symptoms, sleep-related difficulties frequently persist as residual symptoms. If left unaddressed, these persistent sleep problems may contribute to relapse or recurrence of depressive and/or manic episodes (Asarnow & Mirchandaney, 2021).

Children with anxiety disorders often experience difficulties with sleep onset latency, which may stem from persistent anxious thoughts, heightened physiological arousal, or repetitive cognitive and behavioral rituals. Nighttime behavioral challenges are particularly common in younger children with anxiety, frequently driven by fears such as darkness, intruders, imaginary creatures, or separation from a caregiver. These fears may manifest in behaviors such as co-sleeping with parents, bedtime refusal, or resistance to sleeping alone (Crowe & Spiro-Levitt, 2021). Those with panic disorder may experience sleep problems due to the fear of a panic attack during sleep (Brown & Uhde, 2003; Crowe & Spiro-Levitt, 2021).

Childhood Bipolar Disorder and Psychosis

Sleep disturbances associated with bipolar disorder may differ across manic, depressive, and euthymic states. In manic states, the need for sleep is reduced, and so, insomnia is quite common. Both schizophrenia and bipolar disorder are illnesses with subtle signs, including sleep alterations, that manifest years before the onset of actual psychiatric symptoms (Ramtekkar & Ivanenko, 2015; Søndergaard et al., 2021). Schizophrenic and paranoid individuals may have difficulty sleeping due to symptoms of suspicion and doubt. Interestingly, diagnostic criteria for bipolar disorder indicate that individuals in manic states often exhibit a markedly reduced need for sleep. Community-based studies have reported that between 21% and 87.5% of youth with bipolar disorder demonstrate this symptom (Asarnow & Mirchandaney, 2021). In a sample of 8 to 11-year-olds with early-onset bipolar spectrum disorders, 82% report having depression-related sleep problems, with initial insomnia being the most pervasive. Hypersomnia is also particularly salient in youth with bipolar disorder (Harvey et al., 2009; Asarnow & Mirchandaney, 2021).

Children with Visual Impairment

Children with visual impairment may be particularly vulnerable to sleep disturbances due to impaired light perception, which can disrupt circadian entrainment, the alignment of the endogenous circadian rhythm with external environmental cues. Disruption in this synchronization process can lead to various sleep-related difficulties. Previous research has reported a high prevalence of early morning awakenings, prolonged daytime sleep, increased need for physical contact during sleep, difficulties initiating sleep, and frequent nighttime awakenings among children with

visual impairment. Moreover, studies examining the severity of visual impairment in relation to sleep outcomes have demonstrated that children with a complete absence of light perception experience significantly shorter sleep duration compared to those with residual light sensitivity (Ingram et al., 2022; Wagner, 2022).

Diagnostic Challenges

Diagnosing sleep-wake disorders in children and adolescents is particularly challenging because the presentation of these disorders often overlaps with other developmental or psychiatric conditions. Behavioral and emotional symptoms such as irritability, mood swings, and poor academic performance may be misattributed to other causes. Furthermore, many parents may not recognize the severity of their child's sleep problems, attributing them to normal developmental stages or adolescent rebellion (Wheaton et al., 2016).

Polysomnography, a diagnostic test for conditions like sleep apnea, is often underused in pediatric populations due to concerns about its cost and invasiveness (Avidan & Kaplish, 2010). However, it remains the gold standard for diagnosing SRBDs. On the other hand, actigraphy, home sleep monitoring devices, and sleep diaries are useful for detecting sleep disturbances in a less intrusive manner, though they may not always provide a comprehensive picture of the underlying pathology (Sadeh, 2015).

Treatment Strategies

Treatment for sleep-wake disorders in children and adolescents typically involves a multidisciplinary approach, incorporating behavioral, pharmacological, and, in some cases, surgical interventions. Cognitive-behavioral therapy for insomnia (CBT-I) is the first-line treatment for sleep-onset insomnia in children and adolescents. Several studies have shown CBT-I to be effective in improving sleep onset, sleep duration, and overall sleep quality in this population (Doghramji, 2010).

For OSA, the most common intervention is adenotonsillectomy, which has been shown to effectively reduce the symptoms of OSA in children (Marcus, 2001; Stow et al., 2012). In cases where surgery is not an option or the condition persists, continuous positive airway pressure therapy is another effective treatment (Marcus et al., 2012). For DSWPD, behavioral interventions such as chronotherapy, where the sleep-wake cycle is gradually adjusted, can help realign the circadian rhythm. However, the efficacy of such treatments may be influenced by individual factors, such as the timing of puberty and genetic predispositions (Chokroverty, 2010). Pharmacological treatments, such as melatonin, have also been used with some success to help children with DSWPD shift their sleep schedule (Zisapel, 2018).

For comorbid conditions like anxiety or depression, which frequently co-occur with sleep-wake disorders, addressing the underlying mental health issue is crucial. A combination of psychotherapy and medications, when necessary, may offer relief from both the sleep disorder and the psychiatric condition (Ramtekkar & Ivanenko, 2015).

Pharmacological treatments include: Antihistamines, central alpha2-adrenergic receptor agonists such as clonidine and guanfacine, melatonin, benzodiazepines, tricyclic antidepressants, and selective serotonin reuptake inhibitors. Antihistamines are the most widely prescribed sedatives in the pediatric population, despite the lack of research evidence to back up their use (Chaudhari et al., 2023). Central alpha2-adrenergic receptor agonists are used for ADHD treatment. The mechanism of its sedative effect is unclear; however, this side effect could be beneficial for children and adolescents who have both ADHD and insomnia (Felt et al., 2014; Neuchat et al., 2023).

Benzodiazepines are not recommended for routine management of sleep disorders in children but may have a place for treatment of transient insomnia, especially if associated with daytime anxiety (Moturi & Avis, 2010; Mainieri et al., 2023). Tricyclic antidepressants are frequently used in adults with insomnia, but not recommended in children because of their poor safety profile. Trazodone and mirtazapine have potential use in the pediatric population, but their wider application requires further studies (Moturi & Avis, 2010; Mainieri et al., 2023). Use of selective serotonin reuptake inhibitors such as sertraline may be considered for disabling bedtime anxiety (Ramtekkar & Ivanenko, 2015).

Melatonin is a first-line treatment for sleep disorders in children with neurodevelopmental disorders (Souders et al., 2017). Studies show that melatonin can help regulate circadian rhythms and improve sleep onset and quality in children with ASD, visual impairment, and ADHD (Anand et al., 2017; McDonald & Joseph, 2019). It is also effective for ameliorating insomnia, SRBDs, central disorders of hypersomnolence, CRSWDs, and parasomnias without physical dependence (Xie et al., 2017).

Sleep hygiene is also important for treating sleep-wake disorders. Encouraging consistent sleep routines, limiting screen time before bed, and creating a calming sleep environment are key components of sleep management (Bowers & Moyer, 2017; Baranwal et al., 2023). CBT-I has shown efficacy in treating sleep disturbances in children with ADHD, anxiety, and ASD. This therapy targets maladaptive sleep behaviors and helps children develop healthier sleep habits (Kotagal et al., 2024) (Table 2).

Conclusion

Sleep-wake disorders in children and adolescents are complex conditions with a significant impact on multiple aspects of their development. Early recognition, accurate diagnosis, and appropriate treatment are crucial in mitigating their negative effects. As research continues to evolve, it is essential that healthcare providers remain vigilant in assessing sleep patterns and considering sleep disorders as part of the differential diagnosis for a range of pediatric and adolescent behavioral and emotional issues.

Sleep-wake disorders are highly prevalent and significantly impact the lives of children with disorders such as anxiety, depression, psychosis, or ASD, ADHD, and other neurodevelopmental disorders. A multidisciplinary approach that includes behavioral, pharmacological, and environmental strategies is necessary to effectively manage these disorders. Ultimately, healthy and regular sleep is essential for good development and well-being. Sleep problems can lead to multiple irreversible problems in the future. By addressing sleep issues, we can improve children's cognitive, emotional, and social functioning, raise awareness so families can accept their children for who they are and take precautions against potential future problems, and ultimately enhance the quality of life of these children and their families.

While significant progress has been made in understanding sleep-wake disorders in youth, there remain considerable gaps in research, particularly in terms of the long-term consequences of untreated sleep disturbances. More longitudinal studies are needed to determine the full impact of these disorders on adolescent development, including academic performance, social relationships, and future health outcomes. Additionally, further research is needed to explore the genetic and environmental factors that contribute to sleep-wake disorders in youth. Advances in neuroimaging and genetic research hold promise for identifying biomarkers and developing more personalized treatment options.

Future research should focus on long-term studies to explore the impacts of untreated sleep disturbances on developmental outcomes and the efficacy of various treatment modalities over time. Additionally, more research is needed into the use of technology-based interventions, such as sleep apps and wearable devices, to monitor and improve sleep in children with neurodevelopmental disorders. Personalized, family-based interventions that consider the unique needs of both the child and the family could also enhance treatment outcomes (Mindell et al., 2006; Kotagal et al., 2024).

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