

Review Article

Pediatric Sleep Disorders in Youth with Psychiatric Disorders

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Abstract

Pediatric sleep disorders are reported in 95% of youth with mental and neurological conditions. They are associated with mood disturbances, behavioral problems, and impaired academic performance. They predict an earlier onset of alcohol, cigarette, and illicit drug use and the onset, severity and likelihood of relapse of psychiatric disorders. Moreover, sleep problems in children negatively impacts their parents' sleep and thus cause a cascade of burdensome problems including parenting stress which can be associated with harsh parenting. In addition, co-morbid sleep disorders significantly reduce the effectiveness of psychological and pharmacological interventions. Effective treatment of pediatric sleep disorders, however, contributes to better outcomes following these interventions.

Effective behavioral interventions for pediatric sleep disorders in youth have been empirically validated. Such interventions lead to clinically significant improvements and can be effectively implemented by sleep specialists and non-sleep-specialists (e.g., psychologists). However, due to limited availability of sleep specialists and the lack of training that healthcare providers receive on sleep interventions, only a small fraction of children with sleep disorders receive appropriate treatment. The objective of this mini review is to provide a rationale for the integration of evidence-based interventions for pediatric sleep disorders into mental health services, and to review available behavioral evidence-based interventions for pediatric sleep disorders.

ABBREVIATIONS

ADHD: Attention Deficit Hyperactivity Disorder

INTRODUCTION

The Impact of Sleep Disorders on Youth with Psychiatric Disorders

The prevalence of sleep disorders in youth ranges from 30% to as high as 95% in youth with mental and neurological conditions [1,2]. Sleep problems compromise function of brain areas required for emotional and behavioral regulation, learning, memory, intelligence, and executive functions resulting in behavioral problems, inattention, poor academic performance, and emotional dysregulation [3-5]. Sleep loss has been suggested as a predisposing risk factor in the vulnerability to drug addiction, and sleep problems in early childhood have been shown to predict an earlier onset in the use of alcohol, cigarettes, and illicit drugs [6]. Moreover, sleep problems in children negatively impact their parents' sleep and thus cause a cascade of burdensome problems including parenting stress [7,8]. In addition, co-morbid sleep disorders significantly reduce the effectiveness of psychological and pharmacological interventions and increase the likelihood of relapse of psychiatric disorders [9]. Effective treatment of sleep disorders, however, contributes to better outcomes following

these interventions [10]. Economically, the annual cost of sleep disorders is very high. For example, the cost of insomnia in 2009 in the province of Quebec was estimated \$6.6 billion in health related expenditures, for an average annual per-person cost more than 10 times higher than that of a good sleeper [11].

Common Pediatric Sleep Disorders in Youth with Psychiatric Disorders

Clinical studies have implicated poor sleep in the development and persistence of prevalent childhood mental disorders, including depression, anxiety, and attention deficit/hyperactivity disorder (ADHD) [12-16]. The most prevalent sleep disorders in this population are behavioral sleep disorders [17]. Up to 95% of children and adolescents with anxiety disorders experience higher levels of nighttime awakening than controls, as well as sleep-onset insomnia [18-20] and short sleep duration [21]. Strong associations have been established between shortened or irregular sleep patterns and childhood depression [12], with more than 90% of depressed youth presenting with sleep disruptions, such as difficulty falling asleep, difficulty staying asleep, non-refreshing sleep, and daytime sleepiness [16,22,23]. Among youth, a shortened sleep duration is associated with an increased risk of externalizing behavioral problems [24,25] and difficulty falling asleep has been diagnosed in an estimated 25-

50% of children with ADHD [14,26-29]. In the general child and adolescent population, sleep disorders are very prevalent as well, affecting 25–30% of all youth [1,2,12]. This leads to sleep loss and fatigue. Modest sleep loss has been associated with significant deterioration in emotional regulation among youth [2,12,30]. Lack of sleep is thought to reduce the threshold at which negative emotions (e.g., irritability and frustration) are expressed, leading to increased moodiness and emotionality in children [20] and parents [2,3,31,32]. Furthermore, sleep problems in early childhood impair various cognitive and behavioral processes, including learning, memory, and attention (for review see [33]). This causes poor academic performance and triggers behavioral problems in school settings [3,34,35].

Impact of Pediatric Sleep Disorders on Treatment for Psychiatric Disorders

A sleep disorder is often more than merely a correlate or symptom of a psychiatric illness; it can also affect the course of the illness and the response to treatment, and when unresolved, act as a risk factor for relapse. For example, depressed adult patients with abnormal sleep profiles have significantly poorer clinical outcomes with respect to symptom ratings and attrition, while also exhibiting slower and lower rates of remission from depression [9,36]. Patients with depression who experience sleep continuity disturbance and early morning awakening are also more likely to have suicidal ideation than those without such disturbances [37]. Continued insomnia following the acute phase of therapy poses a significant risk for relapse. For example, two-thirds of patients with persistent insomnia at the end of treatment for depression relapsed within 1 year after treatment discontinuation. In contrast, 90% of patients with good sleep at the end of the acute treatment remained well during the first year after discontinuing treatment [38]. There are also indications that disturbed sleep may be a first-occurring prodromal symptom in previously depression-remitted persons [39].

Impact of Treatment of Pediatric Sleep Disorders on Mental Health

Since sleep disorders are so closely associated with mental health, they may be considered an important modifiable risk factor. Indeed, appropriate treatment of sleep disorders not only solves underlying sleep problems, it has significant positive impacts on the daytime functioning of youth. Controlled studies and clinical case reports have yielded ample evidence that behavioral and cognitive/behavioral interventions can effectively treat common childhood sleep problems [40-44]. Following the use of these interventions and the obtained improvements in sleep, researchers have also documented improvements in the mood, daily functioning, and quality-of-life of children with sleep disorders, and their parents [45,46]. Furthermore, interventions targeting sleep have been found to successfully improve psychiatric outcomes. A meta-analysis recently published in JAMA examined the efficacy of cognitive behavioral therapy for insomnia across 37 randomized clinical trials that included 2189 adult patients with insomnia comorbid with psychiatric and medical conditions [47]. The results of this study indicated that the use of cognitive-behavioral methods to treat insomnia has positive effects not only on sleep outcomes,

but also on comorbid outcomes, such as condition-specific clinical indices and general measures of mood and functioning [47]. The improvement in comorbid symptoms was larger in patients with psychiatric disorders compared with those with medical conditions. Collectively, the existing evidence shows that sleep disorders lead to significant daytime impairment and worsening of comorbid psychiatric disorders. Conversely the treatment of sleep disorders significantly improves the efficacy of treatments aimed at comorbid psychiatric disorders, yielding improvements in both sleep and psychiatric outcomes.

Barriers to Sleep Services

Despite the wealth and strength of the empirical evidence indicating that sleep disorders are very common within the pediatric population and have serious consequences for both children and their families, such disorders are commonly under diagnosed [48]. Moreover, although highly effective evidence-based behavioral interventions are available to significantly improve the functioning and mental well-being of those with pediatric sleep disorders, only a small fraction of children with such disorders receive appropriate diagnosis and treatment. Even when sleep issues are identified, such issues are poorly treated. For example, a study that examined the prescription patterns of physicians found that 81% of children with pediatric insomnia were given sleep medication [49]. This is particularly remarkable given that: 1) pharmacological interventions for sleep disorders are not approved by the (US) Food and Drug Administration for the pediatric age; and 2) these medications are ineffective in the long term.

The most frequently reported barriers to pediatric sleep services are related to the lack of training that healthcare providers receive on sleep interventions, the limited availability of sleep specialists, and the insufficient number of sleep centers. Preclinical medical students receive approximately 1 hour of sleep education (on average), and 37% of medical schools reported offering no training on sleep or sleep disorders. Interns and residents receive even less training, with only 23% of programs featuring at least 1 hour of sleep education [50-52]. This lack of basic training is consistent with the finding that practicing physicians and pediatricians have minimal knowledge regarding the importance of sleep and the impact of sleep disorders. Other healthcare professionals also lack the skills and knowledge required to effectively treat pediatric sleep problems. For example, a survey of 212 directors of internship programs in clinical psychology found that only 6% of the programs offered formal comprehensive courses on sleep. The vast majority of the surveyed directors acknowledged that the schools with which they were affiliated provided inadequate training in sleep. Indeed, 41% of the programs offered no training whatsoever on diagnosing or treating sleep disorders [53].

Effective behavioral interventions for many sleep disorders in youth have been empirically validated [2,54] and these interventions lead to clinically significant improvements. The interventions can be effectively implemented by sleep specialists and non-sleep-specialists (e.g., psychologists) [55]. However, the availability of these evidence-based interventions for children is low. Due to the limited availability of sleep specialists and the lack of training that healthcare providers receive on

sleep interventions, only a small fraction of children with sleep disorders receive appropriate treatment [56]. This is a problem because the lack of access to effective evidence-based behavioral interventions for sleep disorders leaves a significant number of children undiagnosed and untreated, and hence at significant risk for mental health problems, increased family stress and reduced effectiveness of the mental-health services they receive. Thus, in the next section we review evidence-based behavioral interventions for youth with sleep disorders.

Behavioral Interventions for Pediatric Sleep Disorders

Effective behavioral interventions aimed at treating pediatric sleep disorders have been empirically validated, including *extinction*, positive routines, bedtime fading, sleep hygiene education, stimulus control and (in adolescents) cognitive behavioral. Behavioral sleep interventions have shown positive outcomes [45,57-59] and behavioral treatments for bedtime problems and night waking appear to be highly effective, with over 80% of treated children demonstrating clinically significant improvements [40-46,54].

Behavioral interventions for pediatric sleep disorders include the following interventions:

Sleep Hygiene. Sleep hygiene refers to a set of sleep-promoting behaviors aimed at improving sleep quantity and quality. It specifically aims to help children develop new healthy sleep habits by: (a) establishing a regular bedtime routine; (b) engaging in non-stimulating activities before bed (i.e., no TV or video games); (c) using dim light only within 1 hour of bedtime (d) not consuming caffeine after lunch (i.e., soda, chocolate); (d) eliminating daytime napping.

Stimulus Control. Stimulus Control consists of a set of instructions designed to establish a consistent sleep/wake rhythm; strengthen the bed and bedroom as cues for sleep; and, weaken them as cues for activities that might interfere or are incompatible with sleep. The following instructions could be used when using Stimulus Control: (a) use of the bed for sleep only (no TV watching, homework in bed); (b) going to bed when sleepy/temporarily delaying bedtime if wide awake; (c) no clock watching; (d) if not asleep within ~20 minutes of getting into bed, getting out of bed and reading (alone) with a dim light.

Graduated Extinction. Graduated extinction is a method for eliminating a problem behavior based on the gradual removal of a reinforce. Use of graduated extinction in relation to sleep helps a child to accept change calmly via progressive learning. Common uses of graduated extinction for sleep include: gradually reducing parental (physical) involvement in bedtime routines; gradually lowering the volume for children who require a TV (or other electronic media) to fall asleep at night; or gradually dimming the lights for children who are afraid to sleep in the dark. The specific design of each graduated extinction approach should be individualized, but usually is completed in no more than 2 weeks. It also is commonly helpful to include specific rewards for progressive success in sleeping alone.

Faded bedtime. Determining a time at which it is likely the child will fall asleep within about 15 minutes of going to bed.

Once the child falls asleep at this time with little resistance, the bedtime is set earlier after a series of successful nights until the desired bedtime is achieved. Also, the child's wake time is set at the same time each day and the child is not allowed to sleep outside the prescribed sleep times. The aims of the treatment are to increase appropriate behaviors and positive associations with sleep and to decrease arousal by helping the child to develop self-soothing skills and fall asleep independently

Bedtime Passes. Bedtime refusal, opposition, and child attempts to co-sleep can be effectively targeted using bedtime passes. Typically, children are given a chosen number of passes (of their own design) each week which can be used for briefly visiting the parent, getting a drink of water, one last kiss or hug, or whatever the child wants, without argument. If a pass is used it is surrendered to the parent. When all passes are used any attempts to get out of bed or gain parental attention are ignored. However, if passes are not used, the child may exchange them for a special reward the next day or at the end of the week. Passes and rewards should be decreased with increasing success.

Cognitive Therapy. This intervention is directed at changing maladaptive attitudes and beliefs by using cognitive restructuring aimed at identifying and changing dysfunctional cognitions. These include, for example, misconceptions about the causes of insomnia, misattributions or amplifications of the consequences of poor sleep, and unrealistic sleep expectations.

Cognitive Behavioral Therapy. A combination of any of the above behavioral (e.g., behavior stimulus control, sleep restriction, relaxation) behavioral sleep interventions, utilizing combinations of sleep hygiene, cognitive therapy and stimulus control strategies.

Pharmacological Interventions for Pediatric Sleep Disorders

The use of medications for insomnia in children should be considered only after a thorough clinical history, establishment of a sleep-related diagnosis, and generally in concert with recommendations for improved sleep hygiene and behavioral sleep interventions and if the sleep problems compromise function of the child and the parents.

The use of atypical anti-psychotic medications for insomnia in healthy children is discouraged as it has been associated with significant metabolic and neurological side effects. In children with severe insomnia in association with co-morbid psychiatric disorders, primary care providers should consult with a child/adolescent psychiatrist to assess the risk/benefit ratio associated with atypical anti-psychotic medications, to assist with potential medication selection and dosage titration, and to ensure that appropriate monitoring procedures for adverse effects are being implemented

Currently, there are no medications that are Food and Drug Administration (FDA) approved to treat insomnia in children. However, some medications have been used by pediatricians as a sleep aid for children and adolescents with neuro developmental disorders that suffer from severe sleep problems. One of the commonly used medication is Clonidine. It is a presynaptic $\alpha 2$ -agonist that is approved by the FDA for the treatment of

hypertension [60], and has frequently been used off label as a sleep aid in children. Clonidine has been safe and well tolerated by children and adolescents in clinical trials [61,62]. The most commonly reported side effects of clonidine include drowsiness, transient sedation, headache, dizziness, fatigue, somnolence, insomnia, hypotension, and bradycardia. These side effects commonly subside or decrease variably over time and are thought to be dose dependent. For more information regarding its mechanism of action, safety, efficacy, and its current place in treatment see [63].

In addition, Melatonin has been used to treat insomnia in youth. Melatonin is an endogenous neurohormone produced and secreted by the pineal gland [64]. Melatonin is reported to have many actions in humans; however, it is most well-known for its role in maintaining circadian sleep-wake cycles [65]. This role in maintaining circadian rhythms is known as melatonin's 'chronobiotic' effect. The production of melatonin is regulated by light exposure, through a pathway that transmits photic stimuli from the outside environment to the pineal gland through the retina [66]. Light exposure inhibits melatonin production while darkness stimulates it, with peak production occurring between 2 a.m. and 4 a.m. [66]. The increasing melatonin levels have a sedative or 'hypnotic' effect on the body, in order to induce and maintain sleep.

The chronobiotic and hypnotic roles of endogenous melatonin parallel the use of exogenous melatonin to treat pediatric sleep disorders. The use of melatonin as a chronobiotic is documented to be effective in treating pediatric sleep disorders of the 'delayed sleep phase type', both in typically developing populations or special populations (e.g. children with autism, children with ADHD). Melatonin treatment can advance the sleep phase by augmenting the secretion of endogenous pineal hormone, while also working as a hypnotic to relieve sleep-onset insomnia by inducing sleep. Melatonin (1-6 mg) can be administered 30-60 minutes hours prior to the usual sleep-onset time. To induce sleep onset and regulate the sleep-wake cycle, fast-release melatonin is typically used [67]. Melatonin, as a hypnotic, is also effective in treating insomnia in children. Controlled-release melatonin is typically used for this purpose, and it is documented to improve sleep maintenance and increase sleep duration [67].

Despite its potential for treating some CRSDs, however, the clinical effectiveness and guidelines for melatonin use (e.g., length of treatment, dosing parameters and timing of administration) have not been firmly established. The studies examining the use of exogenous melatonin to advance the circadian phase in children and adults with DSPD have suffered from methodological flaws and have yielded limited and variable results [68-70]. In the US, Melatonin has not been approved by the FDA for the treatment of CRSD, and its production is largely unregulated. Similarly, Health Canada only recommends the use of melatonin to treat sleep disorders in adults, while it is considered "off-label" for the treatment of sleep difficulties in younger patients [67]. Clearly, more studies on the long-term efficacy and safety of melatonin are required, especially in the context of children and adolescents.

DISCUSSION & CONCLUSION

The integration of prevention, intervention, early diagnosis

and treatment of pediatric sleep disorders into mental health services is expected to suggest a non-pharmacological approach for promoting the mental health of children. Offering cost-effective, evidence based behavioral interventions for sleep disorders that are a co-morbid condition in 95% of cases with psychiatric disorders, is expected to improve mental health outcomes and to reduce the social and economic burden of mental health problems.

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