Paediatric Insomnia

6

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6.1 Case Vignettes

Billy is a 5-year-old boy whose parents reported that they often had to have a bedtime battle with him at night. When promoted to bed, Billy always protested and complained of not feeling tired, and was reluctant to follow the bedtime instructions. He often used stalling and various excuses (e.g., wanting to go to the toilet, asking for water) to resist going to bed. Billy's mother eventually had to lie down with Billy in bed until he fell asleep. She complained that this often took more than an hour of struggle. Billy was also reported to have frequent night wakings. When Billy was up at night, he would go to his parent's bedroom and ask his mother to sleep with him.

Kelly, a 15-year-old girl, reported often struggling with difficulty in falling asleep at night. She also presented with a low mood and a loss of interest and energy during the day. She complained of not being able to shut off her mind and has often been tossing and turning in bed all night. She was frustrated by not being able to get enough rest at night and found it difficult to concentrate at school and get the energy to do things during the day.

6.2 Overview

Insomnia is one of the most common sleep problems in children. It affects approximately one-third of the children in the general population [1]. Childhood insomnia, if not addressed properly, may become chronic and persist across a range of developmental stages [2]. It is often linked to a constellation of negative outcomes, including behavioural and emotional problems in young children, as well as impaired cognitive functioning and poor academic performance in school-aged children, and elevated levels of family stress and poor psychological and physical health as well as impaired quality of life in caregivers [3]. In older children (e.g., adolescents), insomnia symptoms have been reported in association with an increased risk for developing anxiety and depression, interpersonal problems, somatic health problems, self-harm, and suicidal ideation [4]. As such, timely identification and intervention for childhood insomnia is essential.

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6.3 Classification and Diagnostic Criteria of Childhood Insomnia

The clinical presentations and definitions of childhood insomnia may vary depending on age, developmental stage, and cultural context. Paediatric insomnia is typically manifested as bedtime refusal or resistance, problems with falling asleep (without parental presence or assistance, e.g., feeding, rocking), frequent or prolonged night wakings, and early morning awakening. Currently, there is no standard definition of childhood insomnia. Different diagnostic criteria and definitions for childhood insomnia have been used in clinical and research settings. A consensus definition of childhood insomnia has recently been proposed by Mindell et al. [5] as: "*a repeated difficulty with sleep initiation, duration, consolidation, or quality that occurs despite age-appropriate time and opportunity for sleep and results in daytime functional impairment for the child and/or family*." In the ICSD-2 [6], there was a specific category to classify childhood insomnia, i.e. behavioural insomnia of childhood (BIC), which included three main subtypes: *sleep onset association type, limit setting type*, and *combined type*, which have been often used to describe sleep problems in younger children. Table 6.1 shows the characteristics of the three subtypes of behavioural insomnia of childhood.

Childhood insomnia is currently subsumed under the umbrella term "chronic insomnia disorder" in the ICSD-3 [7] and there is no longer any differentiation of subtypes. The diagnostic criteria of insomnia are comparable between the ICSD-3 and DSM-5 (see Table 6.2). According to the ICSD-3 [7] and DSM-5 [8], childhood insomnia is defined as a self-report or parental report of difficulties with night-time sleep (i.e., difficulty falling asleep or problems returning to sleep without a parent or caregiver intervention) that results in some forms of daytime impairment in the child, the parent(s), or the family, and such problems occur at least 3 times per week and the symptoms have been present for at least 3 months. In addition, these symptoms persist despite adequate opportunity and circumstances for sleep, such as sufficient time to sleep, and a safe, comfortable, dark, and quiet sleep environment. To diagnose insomnia disorder, the sleep difficulties should not be explained by other medical conditions, mental disorders, another sleep disorder, or substance use. According to the ICSD-3 [7], insomnia is further classified into *chronic insomnia disorder*, *short-term insomnia disorder,* and *other insomnia disorders*. Depending on the duration of the symptoms, insomnia is classified as either *short-term* (symptoms present for less than 3 months) or *chronic* (symptoms present for more than 3 months).

Table 6.1 Characteristics of the three subtypes of behavioural insomnia of childhood

Subtypes	Common age group	Characteristics
BIC Sleep-Onset Association Type	Infants and toddlers	• Reliance on maladaptive and inappropriate cues for sleep that typically requires parental interventions, such as specific stimulation (e.g., feeding, rocking, watching television), objects (e.g., bottle, toys), or settings (e.g., parents' bed) to fall asleep or get back to sleep after awakening • Difficulty in falling asleep and/or returning to sleep after waking up in the absence of the above conditions
BIC Limit-Setting Type	Pre-school and school-aged children	• Active resistance, verbal protests, and repeated demands at bedtime ("curtain calls") • As a result of insufficient limit setting by the caregiver
BIC Combined Type	Showing the characteristics of both sleep-onset association and limit-setting subtypes	

BIC behavioural insomnia of childhood

Table 6.2 Comparison of ICSD-3 and DSM-5 guidelines for diagnosing insomnia

		ICSD-3	DSM-5
Diagnostic term		"Chronic Insomnia Disorder"	"Insomnia Disorder"
Criterion		Self-report, parent- or caregiver-report of symptoms	Dissatisfaction with sleep quantity or quality reported by individual or complaint made by caregiver or family member
Nocturnal sleep difficulty (at least one of these symptoms)	Difficulty initiating sleep	√	√
	Difficulty maintaining sleep	√	√
	Waking up earlier than desired	√	√
	Resistance to going to bed on appropriate schedule	√	√
	Difficulty sleeping without parent or caregiver intervention	√	√
Related daytime impairments		At least one out of nine domains[a]	At least one out of seven domains
Frequency and duration		Occurring at least 3 times per week and lasting for at least 3 months	
Not explained by inadequate time and opportunity for sleep		√	√
Not better explained by another sleep disorder		√	√
Not better explained by coexisting mental disorders and medical conditions		√	√
Not better explained by the physiological effects of a substance		√	√

[a]As compared to DSM-5, ICSD-3 requires more daytime impairments for the diagnosis of insomnia disorder, including impaired family performance and sleep concerns.

6.4 Prevalence and Consequences of Insomnia

Insomnia is common in the paediatric population, with an estimated prevalence of 20% to 36% in infants and young children (including toddlers and pre-schoolers), 20% to 40% in school-aged children, and 11% to 35% in adolescents. The reported prevalence rates of insomnia in the paediatric population vary across different studies, depending on the sample characteristics (e.g., different age groups and ethnicities), assessment methods (e.g., self-report versus parent/caregiver-report), and defining criteria of insomnia (e.g., symptoms-based versus a clinical diagnosis). The prevalence of insomnia in early childhood is comparable for boys and girls. The gender difference in insomnia often starts to emerge during late and post-puberty where girls are more likely to experience symptoms of insomnia than boys. A previous community-based study showed that the prevalence of insomnia increased from 3.4% to 12.2% (3.6-fold) in girls and from 4.3% to 9.1% (2.1-fold) in boys from pre-puberty to post-puberty [9].

While the assessment of childhood insomnia often relies on parental reports, parents' recall of their child's sleep problem may be subject to recall bias and tend to underestimate their child's insomnia symptoms. For example, a previous study showed that the prevalence of difficulty initiating sleep was 32–40% by child-report vs. 20–25% by parental report [10]. It was found that 23–28% of the children self-reported difficulty in maintaining sleep, whereas such a sleep problem was reported by only 12–14% of the parents of

these children [10]. Previous studies have reported a range of prevalence rates of insomnia in children with different cultural backgrounds, varying from 10% in Vietnam and Thailand, 25% to 30% in the United States and Australia, to as high as 75% in China and Taiwan [11]. A possible explanation for this difference in the prevalence of insomnia might be related to the cultural differences in sleep habits, such as bed-sharing or room sharing. Child-parent bed sharing and room sharing are commonly seen in most Asian countries [12], which make it easier for the caregivers to observe their child's sleep condition during the night. In addition, the activities before bedtime and sleep problems (e.g., snoring, insomnia) of the co-sleepers (caregivers) can potentially cause sleep disturbance for their child who shares the same bed/bedroom [12].

Insomnia is especially prevalent in the paediatric patients with comorbid psychiatric and medical conditions. For example, the prevalence of insomnia was found to be 48–75% in children with depression, and 32% in children with anxiety, 45% in children with cerebral palsy, and 48–56% in children with autism spectrum disorders (ASD) [13, 14]. A previous study showed that the prevalence of bedtime resistance, difficulty falling asleep, and sleep onset delay was 24.6%, 41.3%, and 22.2%, respectively, in children with attention deficit hyperactivity disorder (ADHD), whereas the prevalence of these insomnia symptoms was 9.2%, 17%, and 10.3%, respectively, in typically developing children [15].

Childhood insomnia, if left untreated, is often linked to a constellation of negative health-related and psychosocial outcomes, such as an increased risk for gastroesophageal reflux, and behavioural and emotional problems in young children. In school-aged children, insomnia symptoms have been reported in association with behavioural problems (e.g., hyperactivity, attention deficits, aggression, irritability), impaired cognitive functioning, and poor academic performance. In adolescents, insomnia symptoms have been linked to an increased risk for developing anxiety and depression, interpersonal problems, somatic health problems, substance abuse, self-harm, and suicidal ideation. Not only does childhood insomnia have significant negative impacts on the affected child, but it can also result in detrimental consequences in the family, such as parental psychological and physical health problems and high levels of parental conflict and parent-child conflict. For example, a previous study showed that parents of children with sleep problems have an increased risk of sleep disorders, depressed mood, fatigue, and elevated stress levels as compared to parents of children without sleep problems [3].

6.5 Aetiology of Insomnia

The causes of insomnia are complex and multifactorial. A combination of biological (e.g., genetics, hyperarousal, hypersensitivity, circadian rhythm changes), medical (e.g., asthma, sleep-disordered breathing, ASD, ADHD, anxiety, depression), as well as psychosocial and behavioural factors (e.g., excessive use of electronic media) may contribute to sleep problems in children. Understanding the causes of childhood insomnia, especially those that are potentially modifiable, is critical for the management of insomnia in children.

6.5.1 Biological Factors

Previous research showed that insomnia is linked to multiple genes and environmental factors, as well as complex interactions of gene-gene and gene-environment. A genome-wide association study (GWAS) and a genome-wide gene-based association study (GWGAS) using the UK Biobank sample that included more than 1.3 million adults has identified three loci and seven genes associated with insomnia [16]. A community-based case-control family study conducted in Hong Kong, which involved adolescents with insomnia and their first-degree relatives together with their age- and sex-matched non-insomnia controls and first-degree relatives, showed a significant familial aggregation of insomnia [17]. Previous twin studies have also suggested the role of genetic influences on the

development of childhood insomnia. For example, a study conducted in a sample of 18-month twins (n = 314) showed that heritability was 35.3% for night wakings [18].

Some studies have also suggested that hyperarousal (i.e., heightened arousal systems, hypoactive sleep-inducing pathways, or both) and hypersensitivity might be linked to the development of insomnia in children, especially children with ADHD and ASD. Children with ADHD have been shown to have an increase in cortical activity patterns. Children with ASD often show dysregulation of neurotransmitters (e.g., gamma-aminobutyric acid (GABA), melatonin, serotonin) that can affect sleep by interfering with the normal inhibitory function of GABA and contributing to circadian abnormalities. Children with ASD may also have hypersensitivity to environmental stimulation and difficulties in regulating arousal which may lead to sleep-onset delay.

Changes in endogenous circadian and homeostatic processes (e.g., a delay in the circadian rhythm as reflected by delayed melatonin release, slower accumulation of sleep homeostatic drive) in conjunction with external factors (e.g., increase in academic workload, use of electronic media near bedtime) can lead to an irregularity of sleep schedule and increased sleep difficulty in adolescents [19].

6.5.2 Medical Factors

Several medical conditions could potentially contribute to the development of insomnia in children, such as asthma, upper airway problems (e.g., snoring, obstructive sleep apnea (OSA)), allergies, gastroesophageal reflux, headache, epilepsy, and chronic pain syndromes. Several neurodevelopmental and neuropsychiatric disorders, such as ASD and ADHD, are closely associated with insomnia. Psychiatric disorders, such as anxiety and depression, are often linked to sleep disturbances in children [1].

Some medications may also be linked to increased sleep problems in children. For example, the stimulants (e.g., methylphenidate, amphetamine formulations) that are used to manage ADHD symptoms could potentially prolong sleep onset and increase difficulty in falling asleep, and decrease sleep duration. Medications for asthma (e.g., salbutamol, salmeterol, theophylline) and some antidepressants (e.g., selective serotonin reuptake inhibitors) can potentially disrupt sleep.

6.5.3 Psychosocial and Behavioural Factors

Parental behaviours during bedtime and upon child's nocturnal awakenings, such as night feeding, rocking, and holding the child until he/she falls asleep, may have negative influences on nighttime sleep in young children (e.g., infants) [20]. Co-sleeping (e.g., room-sharing and bed-sharing with siblings or adult caregivers) is another important factor to be considered in the context of paediatric insomnia. Co-sleeping is a culturally diverse practice, with the Eastern societies showing a higher prevalence of co-sleeping as compared with Western societies. A recent systematic review and meta-analysis showed that co-sleeping is associated with bedtime resistance, sleep anxiety, night waking, and parasomnia in children [21]. In particular, co-sleeping is associated with more bedtime resistance and night wakings in children in Western countries, while co-sleeping is related to parasomnia symptoms in children in Eastern countries [21]. In addition, infants and toddlers may experience varying degrees of anxiety and stress after separating from their mother, causing nighttime fears and difficulty in falling asleep.

Social media use and use of electronic devices (e.g., watching TV, using computers and cell phones, playing video games), especially before bedtime, are associated with an increase in pre-sleep arousal and suppressed melatonin secretion, because of excessive light exposure, thereby increasing sleep difficulties in children and adolescents. The consumption of caffeinated drinks (e.g., coffee, black tea, energy drinks) and alcohol intake close to bedtime can negatively affect sleep.

Some children with insomnia may have dysfunctional beliefs that could interfere with their sleep, such as "I can only fall asleep with the teddy bear in my arms," and "If I cannot sleep tonight, I will not be able to concentrate in class tomorrow". A previous study has shown that dysfunctional beliefs and attitudes about sleep, especially pertaining to control and predictability about sleep and causal attributions for insomnia, are associated with sleep difficulties in children [22].

6.6 Assessment

A comprehensive assessment is important for diagnosing insomnia and for developing an individualized treatment plan for the child. This includes taking a thorough sleep and medical history as well as family history, and physical examinations where needed. A comprehensive sleep history provides a detailed background of the child's sleep issues. A variety of subjective (e.g., questionnaires, sleep diaries) and objective measures (e.g., actigraphy) are available and may help to screen and understand the child's sleep problems. Medical and psychiatric history provides important information for understanding the causes or associated factors of insomnia. Family history can also be informative to explore genetic vulnerability and/or learned behaviours within the family context. Caregiver's expectations about the child's sleep should also be considered, as they may not have realistic expectations about their child's sleep or have a lack of adequate sleep knowledge within the child's developmental context.

6.6.1 Sleep History

Unlike in the adult population, where insomnia symptoms are usually reported by patients themselves, the assessment of paediatric insomnia often relies on the report of the parent(s)/caregiver(s). As such, whether a child has a sleep problem or to what extent the child has the sleep problems may be subject to parental recall and caregiver's understanding and interpretation of the child's sleep. In addition, the presenting complaints of paediatric insomnia (e.g., bedtime refusal/resistance, bedtime struggle requiring parental intervention) may be different from those in adults (e.g., subjective complaint of having a difficulty in falling asleep). In addition, the daytime consequences of paediatric insomnia (e.g., hyperactivity, restlessness, academic difficulties) may also appear different from those presented in adults (e.g., fatigue, mood disturbances).

Taking a comprehensive sleep history is important for assessing paediatric insomnia. This should include a detailed assessment of the child's sleep schedule (e.g., when, where, and for how long the child sleeps in a 24-h day, including sleeping in the car, stroller, swing, or at daycare/school), the child's sleep environment (e.g., lighting, noise level, room-sharing with parents or siblings, if any, bed type), sleep habits (e.g., sleep associations, such as parental involvement at bedtime), and bedtime routines (e.g., presence of any routine, types of activities in the evening including use of electronic devices, duration and location of routine).

6.6.2 Medical and Psychiatric History

A thorough medical history should include the evaluation of other possible causes or comorbidities associated with insomnia, including other sleep disorders (e.g., OSA, restless legs syndrome (RLS)/ paediatric limb movement disorder (PLMD), narcolepsy), medical problems (e.g., reflux), neurodevelopmental and psychiatric disorders (e.g., ASD, ADHD, anxiety, depression), and substance use (especially for older children and adolescents). Concurrent medications (e.g., psychostimulants) should also be reviewed.

6.6.3 Subjective Measures

Several questionnaires can be used for assessing sleep problems in children. Table 6.3 lists some of the commonly used measures.

Table 6.3 Questionnaires for the assessment of sleep problems among children

Sleep questionnaire	Acronym	Age group	Self-report or parent/caregiver report	Structure	Period	Measures
Brief Infant Sleep Questionnaire	BISQ	Young children aged 0 to 36 months	Parent/caregiver report	19 items	1 week	Sleep patterns, parent perception, and sleep-related behaviours
BEARS Questionnaire	BEARS	Children and adolescents aged 2 to 18 years	Children (2–12 years): Parent/caregiver report; Adolescent (13–18 years): Self-report	5 items (yes or no)	Not specified	Five sleep domains: bedtime problems, excessive daytime sleepiness, awakenings during the night, regularity and duration of sleep, and snoring
Sleep Disturbance Scale for Children	SDSC	Children and adolescents aged 3 to18 years	Parent/caregiver report	26 items (5-point scale)	6 months	Six sleep problems: sleep-wake transition disorders, disorders of initiating and maintaining sleep, disorders of arousal/ nightmares, sleep hyperhidrosis, disorders of excessive somnolence, and sleep-breathing disorders
Children's Sleep Habits Questionnaire	CSHQ	Children and adolescents aged 4 to 12 years	Parent/caregiver report	45 items (3-point scale)	1 week	Eight sleep problems: bedtime resistance, sleep onset delay, sleep duration, sleep anxiety, night wakings, parasomnias, sleep-disordered breathing, and daytime sleepiness
Adolescent Sleep-Wake Scale	ASWS	Adolescents aged 12–18 years	Self-report	28 items (6-point scale)	1 month	Five behavioural dimensions: difficulty going to bed, falling asleep, maintaining sleep, reinitiating sleep, and returning to wakefulness

A sleep diary can provide prospective information about a child's sleep-wake pattern over an extended period (typically two weeks). Common sleep parameters collected in the sleep diary include bedtime, sleep onset latency, night awakenings, wake-up time, rise time, self-perceived sleep duration, nap time/duration. A sleep diary is usually completed by the parent(s)/caregiver(s) for younger children, and by self-report for adolescents.

6.6.4 Objective Measures

Actigraphy is an objective non-invasive device that uses accelerometry to measure movement magnitude and velocity during waking and sleeping to estimate one's sleep-wake patterns. An actigraphy is a lightweight, waterproof wristwatch-like device that can be worn on a child's non-dominant wrist (for adolescents and older children) or ankle/calf (for infants and tod-

dlers) or may be placed in the child's shirt pocket (for children with ASD). It can collect movement data continuously for multiple days, weeks, or even longer in a child's natural environment. Although actigraphy is not a routine assessment of insomnia, it can provide a more objective and valid measure of sleep than self-reported or parent-reported sleep diaries and may provide extra information about the child's sleep where needed.

Polysomnography (PSG) is not routinely used for the diagnosis and evaluation of insomnia. However, PSG is only indicated if another underlying sleep disorder is suspected. For example, children with upper airway symptoms during sleep, such as snoring and breathing pauses, should undergo overnight PSG to confirm the diagnosis of OSA. Children with RLS often show symptoms of an irresistible urge to move the legs at rest and limb movements during sleep, which may cause sleep difficulties. Overnight PSG followed by multiple sleep latency test (MLST) on the next day is needed for diagnosing narcolepsy if suspected.

6.7 Interventions for Paediatric Insomnia

6.7.1 Non-pharmacological Treatment of Paediatric Insomnia

Non-pharmacological approaches, such as behavioural interventions, are generally recommended as the first-line treatment for paediatric insomnia [1]. Numerous studies have demonstrated that behavioural interventions could lead to reliable and sustained improvements in nighttime sleep and daytime functioning in young children, as well as a positive impact on the family's wellbeing. Behavioural interventions for insomnia can be applied not only in typically developing children but also those with comorbid disorders [23]. In addition, behavioural sleep interventions have been shown to improve not only sleep but also mood symptoms and daytime functioning in children with mood disorders (e.g., depression, anxiety). Previous studies have found significant improvements in ADHD symptoms and neurocognitive outcomes following the behavioural interventions for insomnia in children with ADHD. It was also found that behavioural sleep intervention could lead to reduced sleep onset latency and improved daytime behaviour (e.g., reduced repetitive behaviors) in children with ASD. Parental involvement and parent education are important for implementing behavioural interventions for insomnia in children. Active participation of the parents in the implementation of the behavioural strategies, especially for young children with insomnia, may help to maximize the effectiveness of the treatment.

Common behavioural strategies in the treatment of paediatric insomnia include implementing a consistent bedtime routine, fading out sleep associations, and using consistent positive reinforcement and rewards. These behavioural strategies aim to help the children to establish good sleep practices and develop their abilities to fall asleep and return to sleep independently following normal nighttime arousals. Table 6.4 provides some examples of non-pharmacological interventions for paediatric insomnia. Whilst these approaches are generally safe and effective in children, it may not be appropriate to use *extinction* (which involves prolonged crying in the child) in certain special paediatric populations, such as infants with developmental issues, children with medical conditions (e.g., severe reflux, seizure disorder) and young children with a history of severe anxiety, trauma or self-injurious behaviors.

Cognitive behavioural therapy for insomnia (CBT-I) is a nonpharmacologic treatment designed to address maladaptive sleep behaviors and distorted beliefs about sleep and insomnia [24]. It may be more suitable for older children and especially adolescents with insomnia. CBT-I typically consists of a collection of behavioural and cognitive strategies, including stimulus control, sleep restriction, relaxation training, cognitive therapy, and sleep hygiene education. It

Table 6.4 Non-pharmacological interventions for paediatric insomnia

Strategies	Aim	Target population	Description
Bedtime routine	Establish a consistent bedtime routine and a regular sleep schedule	All children	Implementing a series of pre-bedtime activities (e.g., taking a bath, diaper change, reading a bedtime story, or singing a song) with the child consistently every night
Bedtime fading	Align a child's bedtime with his/her natural circadian rhythm	Young children, young children with a late bedtime	Gradually delaying the child's bedtime to match his/her natural sleep onset time
Standard extinction	Remove negative sleep-onset associations both at bedtime and during the night	Children >6 months old Not appropriate for children with medical conditions (e.g., reactive airway disease, seizure disorder, severe anxiety)	Parents putting the child to bed and subsequently ignoring the child's behaviours (e.g., not responding to the child's crying and tantrums)
Graduated extinction	Remove negative sleep-onset associations at bedtime	Children >6 months old Not appropriate for children with medical conditions (e.g., reactive airway disease, seizure disorder, severe anxiety)	Parents putting the child to bed and ignoring the child's behaviours (e.g., crying, tantrums) for specific periods before briefly checking on the child
Cognitive behavioural therapy for insomnia	Address maladaptive sleep behaviors and distorted beliefs that perpetuate insomnia	Children aged 8 or above	Sleep hygiene education, stimulus control, sleep restriction, relaxation training, and cognitive therapy

should be noted that implementing sleep restriction in adolescents may be challenging because they are often already sleep-deprived during schooldays, particularly due to early school start time. CBT-I is currently recommended as the first-line treatment for chronic insomnia in adults. Whilst there has been substantial evidence to support the clinical efficacy of CBT-I in the adult population, only a limited number of clinical trials of CBT-I have been conducted in the paediatric population. Nonetheless, the existing data consistently supported the positive and sustained effects of CBT-I on improving sleep, mood symptoms, and daytime functioning in adolescents.

6.7.2 Pharmacological Treatment of Paediatric Insomnia

Pharmacological treatment is usually not suggested as the initial treatment option for children with insomnia. While pharmacological treatment of insomnia may be able to produce rapid short-term effects on relieving sleep symptoms, long-term use may lead to reduced efficacy and adverse effects (e.g., sleepwalking, morning hangover, daytime sleepiness, headaches). As such, pharmacological treatments for insomnia are generally recommended for short-term use, and should only be considered when parents cannot adapt to behavioural interventions due to practical constraints (e.g., time-consuming and interfering with parents' routine work) or when behavioural interventions fail to produce adequate improvements. Additionally, sleep medication is rarely considered as the sole treatment and should ideally be offered in combination with behavioral interventions to achieve sustained therapeutic effect and minimize the side effects.

Despite its known side effects, pharmacotherapy is the most common treatment for behavioural insomnia in children. In a national survey conducted in the United States, approximately 75% of children who presented with a sleep disorder were prescribed over-the-counter sleep

aids, and 50% were prescribed sleep medications [25]. Nonetheless, the data on the efficacy, safety, and tolerability of the medications used to treat paediatric insomnia remained limited. The prescription of the medications for managing insomnia in children is mostly based on the extrapolation of adult data and clinical experiences. It is also important to note that there are currently no medications approved by the US Food and Drug Administration (FDA) for the treatment of insomnia in the paediatric population and no well-defined guidelines for the pharmacological treatment of paediatric insomnia. Therefore, clinicians should always exercise caution when using medications for treating insomnia in the paediatric population. In addition, adolescents should be screened for alcohol, tobacco, and illicit drugs and pregnancy before the initiation of medication for insomnia. Physicians need to communicate closely with the family for choosing the best therapy for the child, and follow-up frequently to monitor side effects, especially during withdrawal, to ensure safe and successful management of paediatric insomnia.

There are a variety of over-the-counter and prescription medications that are commonly used in clinical practice to treat insomnia in children. Antihistamines, alpha-agonists, and melatonin are commonly used for treating paediatric insomnia in clinical practice. A survey of 222 paediatricians in the US found that antihistamines (83%) and melatonin (42%) were the most commonly recommended over-the-counter medications to treat insomnia, and antidepressants (tricyclics 31%, other antidepressants 30%) and benzodiazepines (17%) were the most commonly prescribed sedating medications [26]. Antihistamines (e.g., diphenhydramine, cyproheptadine, hydroxyzine) have been considered as a highly acceptable choice for many families, because of their well-tolerance in children and adolescents as well as their low cost and availability in clinical practice. In a randomized controlled trial, 50 school-aged children (age range: 2–12 years) were given either diphenhydramine or a placebo to treat their insomnia. Children receiving diphenhydramine showed a decrease in sleep onset latency and a reduction in night awakenings [27]. However, another study found that diphenhydramine was no more effective than placebo for improving sleep in infants (aged 6 to 15 months, n = 44) with night awakenings [28]. Clonidine is a noradrenergic alpha-2 agonist that has sedative effects. It is generally used in the treatment of ADHD symptoms (especially impulse control in ADHD) and paediatric insomnia. Two open-label retrospective studies have found an improvement in insomnia symptoms in children with neurodevelopmental disorders following clonidine treatment [29, 30]. Melatonin, a hormone secreted by the pineal gland, plays a pivotal role in the regulation of the circadian rhythms as well as sleep and wakefulness. It also possesses sedative and hypnotic properties. Several studies have shown the efficacy of melatonin in reducing sleep onset latency and the number of awakenings during sleep in children and adolescents with chronic sleep-onset insomnia, as well as improving daytime behaviors in children with special needs (e.g., ASD, ADHD). Antidepressants are commonly used to treat insomnia in both paediatric and adult patients with mood disorders. Trazodone is the most commonly prescribed antidepressant to treat insomnia symptoms in children with mood and anxiety disorders. However, there remained very little data on the efficacy and safety of trazodone for treating sleep difficulties in children and adolescents. Clonazepam, an intermediate-acting benzodiazepines may be considered in children with parasomnias and insomnia. A low dose of clonazepam at 0.25 to 0.5 mg may help improve sleep during the night and decrease the arousal threshold in children. Table 6.5 lists some of the medications commonly used for paediatric insomnia.

Table 6.5 Medications used for paediatric insomnia

Class	Medications	Mechanism of action	Effects on sleep	Potential side effects	Note on the use in the paediatric population
Antihistamines	Diphenhydramine Cyproheptadine Hydroxyzine	Block H1-receptors in the central nervous system	Decrease sleep onset latency	Daytime drowsiness, appetite loss, dry mouth, confusion	Children with insomnia
Alpha Agonists	Clonidine Guanfacine	α-adrenergic receptor agonists	Decrease sleep onset latency, reduce slow-wave sleep	Dry mouth, bradycardia, hypotension, REM suppression	Children with comorbid insomnia and ADHD
Hormone Analog	Melatonin	Action at MT1 and MT2 receptors	Decrease sleep onset latency, effect on circadian rhythms	Suppression of the hypothalamic-gonadal axis, headache, nightmares	Children with comorbid insomnia and ADHD, ASD, or blindness
Melatonin Receptor Agonists	Ramelteon	Selective melatonin type 1 and 2 receptor agonists	Decrease sleep onset latency	No significant side effects noted	Children with ASD and insomnia
Benzodiazepines	Clonazepam	Bind to the GABA receptor	Suppress slow-wave sleep, reduce nocturnal arousals	Residual daytime sedation, respiratory function impairment, impulsivity, and memory impairments	Children with insomnia and parasomnias
Nonbenzodiazepine Benzodiazepine Receptor Agonists	Zolpidem Zaleplon	Bind to GABA-A receptor containing alpha-1 subunits	Decrease sleep onset latency	Sleep-walking, drowsiness, confusion, ataxia, slurred speech	Children with insomnia, especially sleep-onset insomnia
Antidepressants	Trazodone	5-HT, serotonin agonist	Increase sleep efficiency, decrease the number of awakenings	Dizziness, central nervous system depressants, hypotension	Children with comorbid insomnia and mood and anxiety disorders
Antipsychotics	Quetiapine	Antagonizes multiple receptors (5-HT, dopamine)	Decrease sleep-onset latency, increase sleep continuity	Hormonal changes, weight gain	Children with comorbid insomnia and psychiatric disorders (e.g., bipolar disorder, aggression)

6.8 Summary and Take-Home Points

Insomnia is highly prevalent in children of all ages, especially in paediatric patients with comorbid psychiatric and medical conditions. Childhood insomnia may become chronic and persist into adulthood if not properly treated. Paediatric insomnia may be linked to a constellation of negative impacts on both the affected child and their caregivers. A comprehensive assessment is important for understanding factors potentially contributing to paediatric insomnia. Non-pharmacological and pharmacological approaches are available to manage insomnia in children and adolescents. Although the use of pharmacological treatment for insomnia is common in paediatric clinical settings, there is a lack of high-quality, well-designed clinical trials on the efficacy, safety, tolerability, and pharmacodynamics profile of medications conducted in children. Behavioral interventions are recommended as the first-line treatment for paediatric insomnia. Parental psychoeducation and involvement in implementing behavioural interventions are important for the successful management of paediatric insomnia, especially for young children.

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