PARASOMNIAS & BEHAVIOURAL SLEEP PROBLEMS IN CHILDREN

Inaugural Paediatric Respiratory and Sleep Medicine Symposium
8 March 2019
PARASOMNIAS

“Undesirable physical events or experiences that occur during entry into sleep, within sleep, or during arousal from sleep”
PARASOMNIAS

- Parasomnias may occur during non-rapid eye movement sleep (NREM), rapid eye movement sleep (REM), or during transitions to and from sleep

- The ‘good’
  - Sleep quality in general remains unaffected

- The ‘bad’
  - The events do lead to significant worry for the caregivers

-AASM, ICSD-3, 2014
Temporary unstable state of dissociation

PATHOPHYSIOLOGY

Modulated by:
- aminergic and cholinergic neurochemical bias
- central nervous system (CNS) activation
- endogenous vs exogenous input
- homeostatic drive
- circadian rhythmicity
PATHOPHYSIOLOGY

• Genetic predisposition

• Dissociation between wake, NREM sleep and REM sleep

• (behaviours characteristic of one stage becoming superimposed on another)
  • During sleep onset: hypnic starts, sleep paralysis, rhythmic movements
  • During sleep: confusional arousals, sleep terrors, sleepwalking

• Subside in most children by 2nd decade
  • Progressive maturation of descending cortical inhibitory projections on brainstem and spinal cord

**NREM-related parasomnias**
- Confusional arousals
- Sleepwalking
- Sleep terrors
- Sleep-related eating disorder

**REM-related parasomnias**
- REM sleep behaviour disorder
- Recurrent isolated sleep paralysis
- Nightmare disorder

**Other parasomnias**
- Exploding head syndrome
- Sleep related hallucinations
- Sleep enuresis
- Parasomnia due to a medical disorder
- Parasomnia due to a Medication or substance
- Parasomnia, unspecified

**Isolated symptoms and normal variants**
- Sleeptalking
**NREM-related parasomnias**
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**Isolated symptoms and normal variants**
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CONFUSIONAL AROUSALS

• Most common in toddlers
  • 17.3% in children 3-13yrs old    (lifetime prevalence 18.5%)
• Onset typically within 2-3 hours of sleep onset
• Sit up in bed, whimper, cry or moan
• “ No...”    “ Go away...”
• Appear distressed
• Remain distressed
• Remains seated in bed

Pre-school children: 88% had at least one parasomnia

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Somnambulism (n = 1035; B: 505/G: 530)</th>
<th>Sleep Terrors (n = 1043; B: 501/G: 542)</th>
<th>Somniloquy (n = 1041; B: 503/G: 538)</th>
<th>Enuresis (n = 1137; B: 551/G: 586)</th>
<th>Bruxism (n = 1062; B: 510/G: 552)</th>
<th>Rhythmic Movements (n = 1058; B: 507/G: 551)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>34 (3.3)</td>
<td>208 (19.9)</td>
<td>505 (48.5)</td>
<td>NA</td>
<td>110 (10.4)</td>
<td>58 (5.5)</td>
</tr>
<tr>
<td>3.5</td>
<td>26 (2.5)</td>
<td>217 (20.8)</td>
<td>561 (53.9)</td>
<td>NA</td>
<td>180 (16.9)</td>
<td>29 (2.7)</td>
</tr>
<tr>
<td>4.0</td>
<td>42 (4.1)</td>
<td>181 (17.4)</td>
<td>606 (58.2)</td>
<td>NA</td>
<td>228 (21.5)</td>
<td>29 (2.7)</td>
</tr>
<tr>
<td>5.0</td>
<td>50 (4.8)</td>
<td>123 (11.8)</td>
<td>634 (60.9)</td>
<td>243 (21.4)</td>
<td>295 (27.8)</td>
<td>28 (2.6)</td>
</tr>
<tr>
<td>6.0</td>
<td>81 (7.8)</td>
<td>118 (11.3)</td>
<td>605 (58.1)</td>
<td>183 (16.1)</td>
<td>346 (32.6)</td>
<td>21 (2.0)</td>
</tr>
<tr>
<td>Overall</td>
<td>150 (14.5)</td>
<td>415 (39.8)</td>
<td>879 (84.4)</td>
<td>284 (25.0)</td>
<td>484 (45.6)</td>
<td>97 (9.2)</td>
</tr>
<tr>
<td>P</td>
<td>NS</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.004</td>
</tr>
</tbody>
</table>

## NREM parasomnias

### Table 1: A comparison of the arousal parasomnias

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>Confusional arousal</th>
<th>Sleep terror</th>
<th>Sleep walking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of onset (years)</td>
<td>2–10</td>
<td>2–10</td>
<td>5–10</td>
</tr>
<tr>
<td>Frequency</td>
<td>3–4 per week to 1–2 per month</td>
<td>3–4 per week to 1–2 per month</td>
<td>3–4 per week to 1–2 per month</td>
</tr>
<tr>
<td>Peak time of occurrence</td>
<td>First third of night sleep</td>
<td>First third of night sleep</td>
<td>First third of night sleep</td>
</tr>
<tr>
<td>Ictal behavior</td>
<td>Whimpering, some articulation, sitting up in bed, inconsolable</td>
<td>Screaming, agitation, flushed face, sweating, inconsolable</td>
<td>Walking about the room or house, may be quiet or agitated; unresponsive to verbal commands</td>
</tr>
<tr>
<td>Ictal polysomnogram</td>
<td>Slow wave sleep with rhythmic theta or delta activity</td>
<td>Slow wave sleep with rhythmic theta or delta activity</td>
<td>Slow wave sleep with rhythmic theta or delta activity</td>
</tr>
<tr>
<td>Duration (min)</td>
<td>10–30</td>
<td>10–20</td>
<td>10–20</td>
</tr>
</tbody>
</table>

### Table 2 Distinction between arousal parasomnias and nocturnal seizures

<table>
<thead>
<tr>
<th>Feature</th>
<th>Arousal parasomnias</th>
<th>Nocturnal seizures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of onset</td>
<td>Preschool age and childhood</td>
<td>Infancy, preschool age, childhood, and adolescence</td>
</tr>
<tr>
<td>Family history of similar events</td>
<td>May be positive</td>
<td>May or may not be positive</td>
</tr>
<tr>
<td>Time of occurrence</td>
<td>First third of night sleep (usually)</td>
<td>Randomly through the night</td>
</tr>
<tr>
<td>Most common sleep stage at occurrence</td>
<td>Slow wave sleep</td>
<td>Stages I or II of NREM sleep</td>
</tr>
<tr>
<td>Duration of event (min)</td>
<td>10–30</td>
<td>0.5–5</td>
</tr>
<tr>
<td>Multiple events on a single night</td>
<td>Less likely</td>
<td>More likely</td>
</tr>
<tr>
<td>Polysomnogram (EEG)</td>
<td>Rhythmic theta or delta activity</td>
<td>Normal/spikes or sharp waves over a focal or generalized distribution</td>
</tr>
<tr>
<td>Usual daytime behavior</td>
<td>Normal (unless complicated by sleep-related breathing disturbance or restless legs/periodic limb movement disorder)</td>
<td>May be irritable and sleepy; seizures may also occur during the day</td>
</tr>
<tr>
<td>Pharmacological therapy</td>
<td>Benzo diazepine at bedtime</td>
<td>Daytime and bedtime administration of oxcarbazepine/lamotrigine/levetiracetam/carbamazepine/phenytoin</td>
</tr>
</tbody>
</table>

Nocturnal frontal lobe seizures: mutations in CHRNA2, CHRNA4, CHRNB2

MANAGEMENT

- No treatment needed for majority
- Educate; reassure
- Avoid triggers
  - Ensure adequate sleep
  - Screen for OSA, PLMD (consider PSG)
  - Educate; reassure
  - Avoid triggers
  - Ensure adequate sleep
  - Screen for OSA, PLMD (consider PSG)

- Emphasize home safety
  - Door alarms
  - Locked grilles/windows
  - Do not attempt to wake the child

- Low dose benzodiazepines
  - SWS suppressants
  - Clonazepam 0.125-0.5mg at bedtime

- Anticipatory awakening
  - 15-30min prior to usual time of occurrence for 2-4wks
  - Alter the sleep state

-Tobin JD. J Pediatr 1991;122:426-427
-JAMA Pediatr. 2015;169(7):704
-Attarian JZ. Int J Neurosci 2013;123:3
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**Nightmare disorder**

- “Bad dreams that awaken the dreamer”

- Recurrent episodes of awakening from sleep with recall of intensely disturbing dream mentation, usually involving fear or anxiety, but also anger, sadness, disgust, and other dysphoric emotions

- Depicted in a 1781 painting by Henry Fuseli, “The Nightmare”
Nightmare disorder

- Full alertness upon awakening
- Intact recall
- Brief, but may have delayed return to sleep

- Second half of the night (early hours of the morning)

- Start between 3-6 yrs old; peaks between 6-10 yrs old
- 10% to 50% of children 3-5yrs old
  - occasional nightmares severe enough to disturb their parents

- Frequent nightmares are uncommon (1-5% of preadolescent children)
  - 2-8% of the general population
  - Related to anxiety-level
  - Trauma-related nightmares (PTSD)

• Reassurance

• Rescripting techniques
  • Create more pleasant endings

• Desensitisation techniques
  • Write/draw the content

• Hypnotherapy
  • 71% improved at 18mths, 67% spell-free after 5 yrs

-Halliday G. Clinical handbook of sleep disorders in children. 1995 p149-175
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SLEEP ENURESIS

Diagnostic Criteria

**Primary Sleep Enuresis** – Criteria A-D must be met
A. The patient is older than five years.
B. The patient exhibits recurrent involuntary voiding during sleep, occurring at least twice a week.
C. The condition has been present for at least three months.
D. The patient has never been consistently dry during sleep.

**Secondary Sleep Enuresis** – Criteria A-D must be met
A. The patient is older than five years.
B. The patient exhibits recurrent involuntary voiding during sleep, occurring at least twice a week.
C. The condition has been present for at least three months.
D. The patient has previously been consistently dry during sleep for at least six months.

-Erdogan A et al. J Paediatr Child Health 2008;44:297-301
SLEEP ENURESIS

• Affects 4-15% of school children
• Prepubertal group: boys 2-3x more common

• Strong genetic predisposition (primary group)
• Acquired factors (secondary group)
  • UTI, OSA, diabetes, psychological disturbances

• Etiology is complex:
  • large nocturnal urine volume production
  • nocturnal bladder overactivity
  • difficulty arousing from sleep

-AASM, ICSD-3, 2014
MANAGEMENT

- No treatment needed before 6 yrs old
- Depends on frequency and severity
- Daytime bladder training
- Alarm systems ('conditioning')
  - Success in 65-80%
  - Relapse rate 10-15%
- Medications
  - Imipramine
  - Oxybutinin
  - Desmopressin
    - Reduce parasympathetic tone of the detrusor
    - Promote fluid retention

-Kamperis K et al. J Urol 2008;179:817-818
BEHAVIOURAL SLEEP PROBLEMS IN CHILDREN
BEHAVIOURAL SLEEP PROBLEMS

Very common

Poor sleep is associated with poorer behaviour, learning, socio-emotional functioning and quality of life (both child & parents)

Problems getting to sleep, problems of waking in the night, or a combination of both
## CASE EXAMPLES

<table>
<thead>
<tr>
<th>Baby M</th>
<th>Little S</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 months old</td>
<td>4 years old</td>
</tr>
<tr>
<td>Nursed to sleep by his mother nightly</td>
<td>Started nursery this year</td>
</tr>
<tr>
<td>Wakes 4-5x in the night, long periods of crying each time</td>
<td>“Late sleeper”</td>
</tr>
<tr>
<td>His mother has to nurse and cuddle him back to sleep each time</td>
<td>Watches cartoons till 2300hr</td>
</tr>
<tr>
<td></td>
<td>Falls asleep on sofa</td>
</tr>
<tr>
<td></td>
<td>Has to wake up at 7am</td>
</tr>
<tr>
<td></td>
<td>Bad temper tantrums; bites other children</td>
</tr>
</tbody>
</table>
Behavioural Insomnia of Childhood (BIC)

• Common
  • Among the most frequent complaints parents present to paediatricians
  • 20-30% in infancy and early childhood

-Mindell JA et al. Behavioural treatment of bedtime problems and night wakings in infants and young children. Sleep 2006;29:1263-76
BEHAVIOURAL INSOMNIA OF CHILDHOOD (BIC)

- Night wakings
- Sleep onset association
- Bedtime struggles
  - Limit setting type
BEDTIME PROBLEMS
(LIMIT-SETTING TYPE BIC)

• 10-30% of toddlers, preschoolers
• Avoidance of bedtime, ‘stalling’ behaviour
• Multiple requests at bedtime
• Parallels the emerging independence of toddlers--- can persist into preschoolers and school aged children
• Testing limits, testing boundaries
• Inadequate enforcement of bedtime limits by the parent/caregiver

-Mindell JA et al. Behavioural treatment of bedtime problems and night wakings in infants and young children. Sleep 2006;29:1263-76
BEHAVIOURAL INSOMNIA OF CHILDHOOD (LIMIT-SETTING TYPE)

Results in:
- Delayed/ Irregular bedtimes
  - Falling asleep only when exhausted
  - Falling asleep in front of the TV
- Inadequate total sleep
- Daytime behaviour problems
- Nightwakings
- Family tensions
BEHAVIOURAL INSOMNIA OF CHILDHOOD (BIC)

- Bedtime struggles
  - Limit setting type
- Night wakings
  - Sleep onset association
BEHAVIOURAL INSOMNIA OF CHILDHOOD  
(SLEEP-ONSET ASSOCIATION TYPE)

• **Sleep associations:**
  • conditions that are habitually present at the time of sleep onset, and the child has learned to fall asleep in its presence

• these same conditions are then required for the child to fall back asleep following night-time arousals
BEHAVIOURAL INSOMNIA OF CHILDHOOD
(SLEEP-ONSET ASSOCIATION TYPE)

<table>
<thead>
<tr>
<th>Prevalence:</th>
<th>Risk factors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 6-12 months olds: 25-50% (even up to 70%)</td>
<td>• Co-sleeping, breastfeeding, acquisition of milestones, illness, parental anxiety, difficult temperament</td>
</tr>
<tr>
<td>• 1 year olds: 30%</td>
<td></td>
</tr>
<tr>
<td>• 1-3 year olds (even up to school age): 15-20%</td>
<td></td>
</tr>
</tbody>
</table>
BEHAVIOURAL INSOMNIA OF CHILDHOOD
(SLEEP ONSET ASSOCIATION TYPE)

Problematic/inappropriate: require parental intervention, inability to self soothe

Rocking, swinging, nursing, continuously patting a child’s back, parent holding on to a pacifier without letting it fall out of the child’s mouth

Primary cause of frequent nightwakings may occur as often as every 90-120 minutes
BEHAVIOURAL INSOMNIA OF CHILDHOOD (SLEEP ONSET ASSOCIATION TYPE)

• Results in:

• Disrupted sleep

• Delayed sleep onset
  – parents rocking child to sleep find it hard to put the child down in crib without waking the child
  – child would wake and whole sequence starts again

• Daytime irritability
• Associations involving parent/caregiver: problematic
  • Parental presence required
    • Rocking, lying down with child, nursing, feeding
    • One of the most common predictors of frequent night wakings

• Physiological arousals (part of normal sleep architecture) become obvious to parents

• Often co-exist with bedtime problems

• Exclude medical causes: eczema, reflux, OSA etc.

NIGHT WAKINGS
(SLEEP-ONSET ASSOCIATION TYPE BIC)
If left untreated....

• Consequences:
  • Emotional
  • Cognitive
  • Behavioural
  • Academic
  • Metabolic
  • Parents!

Lam et al, 2003
Mindell and Owens, 2009
Fallone et al, 2002
TREATMENT OF BIC
-PHARMACOLOGY VS BEHAVIOURAL

- No FDA approved medication for paediatric insomnia
- Paucity of data on the use of medication


TREATMENT OF BIC
-PHARMACOLOGY VS BEHAVIOURAL

- Safety and side effects
- No long term positive effects on sleep

- Growing evidence on behavioural strategies
  - More effective
  - Better acceptance
  - Avoid adverse effects of medications
  - Benefits extend to daytime


-Mindell JA et al. Behavioral treatment of bedtime problems and night waking in infants and young children. Sleep 2006;29(10):1263-76
1. Consistent sleep schedule with age-appropriate bedtime
   • Set consistent bedtime between 7:00 and 8:30 p.m.
   • Maintain bedtime 7 nights per week
   • Use bedtime fading to advance bedtime if needed

2. Consistent bedtime routine
   • Provide verbal cues or warnings prior to transition to bedtime routine
   • Implement standardized routine, 20–30 min in duration, with 2–3 activities
   • Move routine toward the child’s sleeping environment
   • Use bedtime chart used to maintain standardization

3. Teach child to fall asleep independently
   • Select approach based on child’s temperament and parent’s tolerance
     (standard extinction, graduated extinction, or fading of parental presence)
• Positive sleep habits:
  • Consistent sleep schedule
    • School and non-school days
    • Adequate sleep hours
  • Regular bedtime routine
    • Bedtime routine alone improved SOL, night wakings, sleep continuity, mood
  • Conducive conditions to fall asleep
    • Avoiding sleeping while feeding, avoidance of electronics close to bedtime

• Direct benefit to improvement in sleep?

• Putting the child to bed at a fixed time and ignoring the cries until a specified wake time
• Well-validated
• Consistency is key
• Stressful; prolonged crying periods
• Extinction ‘burst’


INTERVENTIONS
-GRADUATED EXTINCTION

• Negative behaviour ignored only for a specified duration
• Parent/caregiver can check in on the child, give brief reassurances/limited attention till child falls asleep
• Goals:
  • Increase independence of child
  • Develop self-soothing skills
  • Reduce negative behaviours, increase positive sleep associations
INTERVENTIONS
-GRADUATED EXTINCTION

Successful approaches:

• Gradually moving the parent a little further from the child each night
  • eventually till the parent is out of the room
• Checking in on the child at fixed intervals (3-5 minutes)
• Checking in on progressively longer intervals (3 min, 5 min, 10 min)

INTERVENTIONS
- GRADUATED EXTINCTION

• Factors to consider:
  • Child’s temperament
  • Safety
  • Parents’ comfort level and acceptability

• Gentler approach
• Better accepted

• Bedtime pass

-Moore BA et al. J Pediatric Psychol 2007;32:283-7
INTERVENTIONS

- POSITIVE ROUTINES WITH FADED BEDTIME

• Short, enjoyable bedtime routine at a time close to the child’s current bedtime (often later than desired)

• Association between:
  • positive bedtime routine <-> falling asleep quickly

• Gradually bedtime is moved forward by 15 minutes

• Wake time is set at the same time daily, child not allowed to sleep otherwise

• Modified: Faded bedtime with response cost
  - removed from bed if doesn’t fall asleep within a certain time

INTERVENTIONS - SCHEDULEDAWAKENINGS

- For night wakings that are consistent and at predictable times
- Track timings of wakings
- Wake the child 15-20 minutes before a usual waking
- The interval between scheduled wakings is then gradually increased
- Used less frequently
- Harder to implement

INTERVENTION

Parental education/prevention
• Helping children develop self-soothing skills
• Reinforcing positive sleep hygiene practices

Internet interventions
• Internet based information to parents about how their child’s sleep compared to a normative sample of same-aged children
• Customised, behaviourally based advice on how to improve the child’s sleep

INTERVENTIONS

• How effective are they?

• Across 52 studies, 94% had clinically significant effects (82% reported improvement for 3-6 months)

![Table 4—Frequency and Percent of Studies Reporting Durability of Sleep Improvements](image)

-Mindell JA et al. Behavioural treatment of bedtime problems and night wakings in infants and young children. Sleep 2006;29:1263-76

-Morgenhaler TI. Practice parameters for behavioural treatment of bedtime problems and night wakings in infants and young children. Sleep 2006;29(10):1277-81

CASE EXAMPLE 1

Baby M

- 10 months old
- Nursed to sleep by his mother nightly
- Wakes 4-5x in the night, unconsolable each time
- His mother has to nurse and cuddle him back to sleep each time

*Exclude medical cause

Incorporate regular bedtime routine

Avoid nursing till fully asleep
Encourage self soothing

Tackle the bedtime issue first, watchful waiting for the night wakings

Be patient!
May take days to weeks

May get worse with acquisition of new milestone
CASE EXAMPLE 2

Little S
- 4 years old
- Started nursery this year
- “Late sleeper”
- Watches cartoons till 2300hr
- Falls asleep on sofa
- Has to wake up at 7am
- Bad temper tantrums; bites other children

Set appropriate intended bedtime

Establishment of bedtime routine (not involving screen time); star charts

Graduated extinction; addressing of bedtime fears

It took 2 weeks!
Sleeping from 9pm to 7 am at both grandma’s home and her own home
Happy child and doing well in school
OBSTACLES TO TREATMENT OF BIC

1. Inconsistent parental limit-setting
   - Give positive reinforcement for targeted behavior
   - Ignore unwanted and negative behaviors
   - Give child control over situation through forced choices
   - Use commands instead of questions
2. Parental disagreement about how to handle bedtime problems
   - Include both parents in design of treatment plan to ensure buy-in and success
   - Encourage parents to support one another
3. Other children in the home
   - Put a fan, humidifier, or white noise machine in bedrooms of the patient and siblings
   - Use reward system for all children in the home, targeting sleep or other specific daytime behaviors
   - If the child shares a room with a sibling, consider moving the sibling to another room for the duration of treatment
4. Child does not stay in crib or bed
   - Use crib tent to keep child safely in cribs until the age of 3 years when possible
   - Place baby gate in bedroom doorway for toddlers to keep them in their room
5. Treatment difficult due to time and energy required
   - Education about how the long-term benefits outweigh the short-term time and energy commitment
   - Regular phone support with trained professionals may increase adherence by providing minor modifications to treatment plan

Meltzer LJ. Behavioral Sleep Medicine, 8:172–189, 2010
Bedtime struggles and night wakings are highly prevalent in infants, toddlers, and preschoolers.

Results in insufficient sleep, negative effects on child and family.

Compared to medications, strong evidence to support behavioural interventions.

Parents need to come forth!

Every patient and family is different: individualised treatment plan!
THANK YOU !