

Original Research Article

HIDDEN IN PLAIN SIGHT: DETECTING PEDIATRIC SLEEP ISSUES WITH THE BEARS SCREENING ALGORITHM IN A CLINICAL SETTING

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ABSTRACT

Background: Sleep is a cornerstone of children's physical and cognitive development, with insufficient sleep linked to a range of behavioral, emotional, and cognitive challenges. However, sleep disturbances in children are often underreported, as children themselves may not recognize or communicate these issues. Early detection of pediatric sleep problems is crucial, especially in a clinical setting. The BEARS Sleep Screening Algorithm—which assesses Bedtime Issues, Excessive Daytime Sleepiness, Awakenings, Regularity and Duration, and Snoring—is a validated and effective tool for identifying sleep-related issues in children. **Aims & objectives:** This study explores the prevalence of pediatric sleep disturbances in a clinical population, aiming to promote early intervention and awareness.

Materials and Methods: A cross-sectional observational study done in a tertiary health care setting among the children of age 2-12 years.

Results: The Sleep-related issues are prevalent in 37.66% of the pediatric population. Key predictors of EDS include irregular sleep patterns and latenight screen exposure. Younger children face more issues related to day naps and night awakenings, while older children are more affected by excessive daytime sleepiness and weekend variations. Parents' awareness of sleep problems was low, with only 1.9% seeking medical advice

Keywords: Sleep disturbances, Snoring, awakening, screening algorithms.

INTRODUCTION

Sleep plays a crucial role in a child's development, cognitive function. influencing emotional regulation, physical growth, and overall health. However, sleep disturbances in children are often overlooked in clinical practice.[1] Unlike adults, children may not articulate their sleep issues, and parents may not recognize the signs, leaving many sleep-related problems "hidden in plain sight,".^[2] This lack of awareness can lead to untreated sleep disorders, which can have far-reaching consequences, including behavioral issues, academic struggles, and increased risk for long-term health conditions such as obesity, hypertension, and diabetes.

Research suggests that sleep disturbances affect up to 30% of children,^[3] yet these issues frequently go undiagnosed in clinical practice. Structured

screening tools, like the BEARS Sleep Screening Algorithm, offer a way to bridge this gap. The BEARS algorithm is designed to screen for common sleep problems through five key domains: Bedtime issues, Excessive daytime sleepiness, Awakenings during the night, Regularity and duration of sleep, and Snoring.^[4] By covering these essential aspects, the BEARS algorithm provides a quick, ageappropriate framework for assessing sleep issues in children aged.^[2-12]

Rationale

This study aims to address this gap by applying the BEARS algorithm to screen for sleep problems in children aged 2-12 years attending the pediatric OPD at a tertiary care hospital. By systematically identifying sleep issues, this study seeks to provide insights into the prevalence and nature of pediatric sleep disturbances within this population. The findings will underscore the importance of routine

sleep screening in pediatric practice and may encourage healthcare providers to adopt the BEARS algorithm as part of regular clinical evaluations. Early detection and intervention can promote better sleep hygiene, which is essential for healthy childhood development and well-being.

Aims and Objectives

- 1. To evaluate the prevalence of sleep disturbances in children aged 2-12 years attending the Pediatric OPD of a tertiary care hospital using the BEARS Sleep Screening Algorithm.
- 2. To investigate the relationship between sleep disturbances and various demographic factors, such as age, gender, and socio-economic background.

MATERIALS AND METHODS

Study Design

This study employs a cross-sectional observational design to assess pediatric sleep problems in a clinical setting using the BEARS Sleep Screening Algorithm.

Place of Study

The study was conducted at the Pediatric OPD (Outpatient Department) of a Medical College Hospital, a tertiary care facility serving a large pediatric population.

Study Period

The study was conducted over a one-year period to ensure adequate sampling and to capture seasonal variations in sleep patterns that may affect the data.

Study Population

Children aged 2-12 years attending the Child Guidance Clinic in the Pediatric OPD during the study period formed the study population. The target population included the children presenting with various complaints, allowing for a comprehensive sample of pediatric sleep concerns.

Sample Size:

The study included all children meeting the inclusion criteria who attend the Pediatric OPD during the study period. For better representation, the sample was equally divided into two groups:

1. Toddlers / Pre-school children (2-5 years)

2. School children (6-12 years)

This equal distribution ensured that both age groups are adequately represented, allowing for comparative analysis across developmental stages.

Inclusion Criteria

Children aged 2-12 years attending the Pediatric OPD during the study period, whose parents or guardians provide written consent, were included in the study.

Exclusion Criteria

Children with critical illnesses (e.g., cancer, neurological disorders, severe infections) were excluded, as these conditions may confound the results of the study due to their impact on sleep patterns.

Data Collection

Data collection was carried out using a pre-designed questionnaire based on the BEARS Sleep Screening Algorithm, which covers the following key areas:

- 1. Bedtime Issues
- Questions assessed children's bedtime routines, including delays in sleep onset, reluctance to go to bed, or struggles with bedtime transitions.
- 2. Excessive Daytime Sleepiness
- Parents were asked about their child's behavior during the day, including whether they seem excessively tired or irritable, have trouble staying awake during normal activities, or experience sudden episodes of drowsiness.
- 3. Awakenings
- Parents reported the frequency and nature of their child's nighttime awakenings, including whether the child has difficulty falling back to sleep after waking and if they frequently call out during the night.
- 4. Regularity and Duration
- The questionnaire captured information about the consistency of the child's sleep schedule and the number of hours they typically sleep each night, as well as any variation in sleep patterns on weekends or holidays.
- 5. Snoring
- Parents were asked if the child exhibits snoring during sleep, as snoring can be indicative of underlying sleep disorders such as sleep apnea.

Each child was assessed using this tool, with responses recorded either by the parent or guardian for children under 6 years, and by self-report for children over 6 years (where appropriate).

Data entry and Data Analysis

Data was carefully recorded on pre-prepared questionnaires and then entered a master chart using Microsoft Excel for easy organization and analysis. Descriptive statistics were used to summarize the demographic details and the prevalence of various sleep disturbances. Categorical data (e.g., bedtime issues, snoring, daytime sleepiness) was analyzed using the Pearson Chi-square test to evaluate associations between different variables (e.g., age group, gender, and specific sleep issues). P-values less than 0.05 were considered statistically significant to ensure reliable findings. Frequency distributions were used to determine the most common sleep disturbances among the sample. Logistic Regression Analysis for Predictors of Excessive Daytime Sleepiness was done.

Ethical Considerations

The study was conducted in accordance with ethical guidelines and received approval from the Institutional Ethical Committee. Informed consent was obtained from the parents or guardians of all children involved in the study.

RESULTS

A total of 316 children aged 2-12 years attending the pediatric outpatient department were evaluated. The participants were evenly divided into two age groups: 2-5 years (n=158, 50%) and 6-12 years (n=158, 50%), ensuring balanced representation.

Demographic Characteristics

Age and Sex Distribution

In the younger age group (2-5 years), out of 158, males accounted for 94(59.5%) and females accounted for 64 (40.5%). Among children aged 6–12 years, out of 158 children, the male-to-female ratio was nearly equal, with 80 (50.6%) males and 78 (49.4%) females. The difference in sex

distribution was not statistically significant (P=0.11).

Residence Distribution

Overall, 173 (54.7%) children resided in urban areas, while 143 (45.3%) came from rural settings. The proportion of urban residents was slightly higher among the older children (6–12 years) at 58.9%, compared to 50.6% in the younger group. However, this difference was not statistically significant (P=0.14).

Socioeconomic Status (SES)

More children belonged to the upper socioeconomic group 182(57.59%) compared to the 134(42.41%) to lower group.

Table 1: Demographic and Socioeconomic Characteristics				
Characteristics	2–5 Years (n=158) (%)	6–12 Years (n=158) (%)	Total (n=316) (%)	
GENDER				
Male	94 (29.75)	80 (25.32)	174 (55.06)	
Female	64 (20.25)	78 (24.68)	142 (44.94)	
RESIDENCE				
Rural Residence	78 (24.68)	65 (20.57)	143 (45.25)	
Urban Residence	80 (25.32)	93 (29.43)	173 (54.75)	
SOCIO-ECONOMIC STATUS				
Lower SES	69 (21.84)	65 (20.57)	134 (42.41)	
Upper SES	89 (28.16)	93 (29.43)	182 (57.59)	

Caregiver and Family Dynamics Primary Caregiver

Mothers were the primary caregivers for 307 (97.1%) of children, with minimal involvement of other caregivers such as grandmothers (2.5%) or hostel care (0.3%). The difference in caregiver distribution between the age groups was statistically significant (P=0.016).

Family Structure

Nuclear families were predominant, accounting for 230 (72.8%) of households, with joint families comprising 86 (27.2%). The proportion of nuclear families was higher among older children (6–12 years: 78.3%) compared to younger children (2–5 years: 67.7%; P=0.04).

Number of Children in the Family

Two-child families were the most common (67.4%), followed by single-child families (20.6%) and threechild families (11.7%). The presence of more than three children in a family was rare (0.3%).

Sleep Patterns

Bedtime and Sleep Duration

The average bedtime across all children was 9:43 PM, with younger children (2–5 years) going to bed earlier (9:30 PM) than older children (6–12 years, 9:55 PM). The average wake-up time was 7:18 AM, with no significant variation between groups.

Sleep duration, including daytime naps, was longer in younger children (10.4 hours) than in older children (9.2 hours). The decline in sleep duration with age was statistically significant (P=0.00006).

Daytime Napping

Daytime naps were more common among younger children: 23.1% of children aged 2–5 years napped for more than one hour daily, compared to only 2.9% in children aged 6–12 years. Daytime naps were largely absent in school-aged children (P<0.0001).

Prevalence of Sleep Problems

The overall prevalence of sleep-related issues was 37.66% out of 316 children. The bedtime problems were reported in 10.76% of the population out of 316 children, with slightly higher rates (5.70%) among school-aged children, compared to younger children (5.06%) out of 158 children in each group.

Night Awakenings and Reasons: Night awakenings were observed in 10.13% out of 316 children. Common reasons in younger children (2–5 years) were bedwetting (3.80%) and thirst (1.90%). Common reasons in older children (6–12 years) were nightmares (0.63%) and the need to visit the restroom (0.95%).

Table 2: Prevalence of Sleep Problems and Associated Factors				
Sleep Problem	2–5 Years (n=158) (%)	6–12 Years (n=158) (%)	Total (n=316) (%)	
Bedtime Problems	16 (5.06)	18 (5.70)	34 (10.76)	
Night Awakenings	20 (6.33)	12 (3.80)	32 (10.13)	
Bedwetting	12 (3.80)	2 (0.63)	14 (4.43)	
Nightmares	5 (1.58)	2 (0.63)	7 (2.22)	
Thirst	6 (1.90)	1 (0.32)	7 (2.22)	
Restroom Visits	4 (1.27)	3 (0.95)	7 (2.22)	

- 2. Excessive Daytime Sleepiness (EDS): Excessive daytime sleepiness (EDS) was reported by 7.6% (n=24) of children, with a higher prevalence in older children (14.6%, P=0.000002). Symptoms included fatigue, difficulty waking up, and napping during inappropriate times.
- Day Naps: out of 316 children, daytime napping was more common in younger children 73 (26.27%) compared to older children 9 (2.85%), which was significant (p < 0.0001).
- 4. **Regularity and Sleep Duration:** Regular sleep schedules were followed by 260 (82.28%) children. The mean total sleep duration was longer in younger children (10.4 hours) than older children (9.17 hours).
- 5. Weekend Variations: Variations in bedtime or wake-up time greater than 1 hour during weekends were observed in 27 (8.54%) of children, predominantly older children.
- 6. **Morning Wake-Up Time:** Difficulty waking up in the morning was reported in 21(13.3%) children out of 158 older children, a significant indicator of excessive daytime sleepiness.

Lifestyle Factors and Sleep

Screen Time

Duration of Screen exposure >1 hour/day was reported in 242 (76.58%) children out of 316 of children. Late-Night Screen Time was seen in 111 (35.13%)children out of 316 children, who used screens after 9 PM, which is significantly associated with bedtime problems (p = 0.009).

Physical Activity:

Out of 316 children, regular physical activity was observed in only 107 (33.86%) children. Those engaging in regular activity had significantly fewer sleep problems and less screen time (p = 0.01).

Bedtime Routine

Most children (86.7%) lacked a consistent bedtime routine. Storytelling (4.4%) and toys (2.2%) were the most common routines for younger children, while older children often engaged with screens (TV or mobile: 3.1%). This variation was statistically significant (P=0.0005).

Multivariate Analysis

Logistic regression analysis was performed to identify predictors of excessive daytime sleepiness (EDS). The analysis included variables such as irregular sleep patterns, screen time exceeding 1 hour, and screen time after 9 PM. Irregular sleep patterns and screen time after 9 PM emerged as significant contributors to EDS.

Irregular Sleep Patterns: Children with irregular sleep schedules were 2.7 times more likely to exhibit EDS (Odds Ratio [OR]: 2.7, 95% Confidence Interval [CI]: 1.5-4.9, p < 0.001).

Screen Time After 9 PM: Late-night screen exposure increased the odds of EDS by 1.9 times (OR: 1.9, 95% CI: 1.1-3.4, p = 0.02).

Screen Time >1 Hour: Although not statistically significant, a trend towards increased EDS was observed (OR: 1.5, 95% CI: 0.9-2.8, p = 0.07).

Table 3: Logistic Regression Analysis for Predictors of EDS					
Predictor	Odds Ratio (95% CI)	p-value			
Irregular Sleep Pattern	2.7 (1.5-4.9)	<0.001			
Screen Time >1 Hour	1.5 (0.9–2.8)	0.07			
Screen Time After 9 PM	1.9 (1.1–3.4)	0.02			
Night Awakenings	1.4 (0.8–2.5)	0.18			

These findings suggest that maintaining regular sleep patterns and limiting screen time, especially after 9 PM, are critical in mitigating excessive daytime sleepiness in children. Educational interventions targeting parents and caregivers should emphasize the importance of these modifiable lifestyle factors.

DISCUSSION

The present study sought to assess pediatric sleep disturbances using the BEARS Sleep Screening Algorithm among children aged 2–12 years attending a tertiary care pediatric outpatient department. The findings revealed a considerable prevalence of sleep problems, aligning with previously reported figures in both Indian and international contexts.

A comparable Indian study by Barathy et al. (2017),^[5] conducted in Puducherry identified similar

disturbances in sleep onset and duration in young children, which corroborates our observations, particularly among the 3–6-year age group, where bedtime resistance and nighttime awakenings were common. Ebrahimi et al. (2013),^[6] also reported a high prevalence of sleep problems among preschool and school-age children in Tehran, affirming the widespread nature of such issues globally.

In relation to the dimensions assessed by BEARS— Bedtime issues, Excessive daytime sleepiness, Awakenings, Regularity, and Snoring—our results highlight bedtime issues and nighttime awakenings as predominant, echoing findings from Fricke-Oerkermann et al. (2007),^[7] who documented the persistence of sleep problems through childhood. Furthermore, excessive daytime sleepiness, though less frequent in our sample, aligns with findings by Dahl (1996),^[8] who emphasized the neurocognitive impact of insufficient sleep in children.

Snoring, as a marker for possible obstructive sleep apnea, was reported in a minor subset of our sample.

This finding aligns with Gozal's (1998),^[9] work, which demonstrated the negative academic impact of sleep-disordered breathing, thereby indicating a need for early identification of such symptoms in clinical settings.

The use of BEARS provided a structured yet rapid method for identifying varied sleep problems. This supports Moturi and Avis (2010),^[10] who advocated for routine screening tools in pediatric practice. Importantly, our findings reinforce Paruthi et al. (2016),^[11] whose consensus recommendations stress age-appropriate sleep durations and structured bedtime routines, a component often lacking in our sample population.

Sadeh et al. (2010),^[12] and Mazzone et al. (2018),^[13] discussed the influence of parenting and neurodevelopmental conditions on sleep patterns. Although our study did not formally assess autism or psychiatric comorbidities, anecdotal parental reports suggested behavioral and attention-related concerns in children with disturbed sleep, warranting further research.

Additionally, cultural practices, co-sleeping patterns, and screen exposure were reported by parents as contributing factors—echoing findings by Green et al. (2017),^[14] and Irish et al. (2015),^[15] who emphasized environmental and behavioral impacts on sleep hygiene.

Our data also observed that irregular sleep routines were common during weekends, which mirrors the "social jet lag" phenomenon described in adolescent sleep studies by Brand and Kirov (2011).^[16] Although our study focused on younger children, the onset of irregularity in sleep patterns may begin earlier than previously considered.

Moreover, the developmental implications of poor sleep, as highlighted by Schwartz and Roth (2008),^[17] are of public health relevance. Parents' awareness and perception of sleep problems were variable in our study, an observation also made by the Institute of Medicine (2006),^[18] which emphasized a significant under-recognition of pediatric sleep disorders.

Interestingly, no significant gender difference was found in sleep problem prevalence in our study, contrasting with findings from Johnson et al. (2006),^[19] that reported emergent gender differences in adolescent insomnia. This discrepancy could be age-related and needs longitudinal exploration.

In terms of limitations, while BEARS is an efficient screening tool, it relies on parental reporting, which may introduce recall or reporting bias. However, as Palermo et al. (2007),^[20] suggested, subjective reports remain vital given the feasibility constraints of objective tools like polysomnography in routine OPD settings.

Limitations

• **Parental bias:** The reliance on parent reports could introduce bias, as parents may not always be aware of or accurately report sleep-related issues.

- **Subjectivity:** The subjective nature of the BEARS algorithm responses may limit the precision of the findings.
- Exclusion of critically ill children: While excluding children with critical illnesses ensures clarity, it may limit the generalizability of the findings to the broader pediatric population, including those with complex medical conditions.

CONCLUSION

This study aims to provide valuable insights into the prevalence and nature of pediatric sleep disturbances in a clinical setting. By using a validated screening tool (BEARS), it seeks to identify under-recognized sleep problems in children and promote timely interventions to improve their overall health and development.

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