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Profile of paediatric sleep patients and polysomnography findings: Experience from an exclusive paediatric sleep clinic in India

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ABSTRACT

Objectives: The objectives of the study were to describe the profile of patients attending an exclusive paediatric sleep clinic in India.

Materials and Methods: Children aged 1 month–18 years, attending an exclusive paediatric sleep clinic, were assessed using standardized questionnaires. Children underwent sleep coaching, were treated medically, or underwent polysomnography based on the decision of the paediatric pulmonologist. Level 1 polysomnography was conducted by trained personnel.

Results: Of 186 children, 36.5% were for infant sleep issues, 24.7% suspected obstructive sleep apnea (OSA), 18.2% neuromuscular diseases with sleep problems, 15.6% genetic disorders with sleep problems, 4.3% parasomnias, and 0.5% abnormal movements during sleep. Of the 85 paediatric polysomnographies conducted, 9.4% were normal studies, 87% had OSA, 1.1% restless leg syndrome, and 2.3% were inadequate studies.

Conclusion: Sleep disorders in children are not uncommon and paediatricians need to be aware and identify them early. More number of exclusive paediatric sleep clinics need to be established in India.

Keywords: Sleep, Polysomnography, Obstructive sleep apnea, Neuromuscular, Genetic

INTRODUCTION

Sleep plays a critical role in the neurological development, cognition, and behaviour of children.[1] About 15%–40% of children in different parts of the world are reported to have sleep problems.[2,3] In a school-based study in India,[4] the prevalence of sleep disorders was found to be 47.5% with 12.7% having snoring and 4.8% having features of sleep-disordered breathing (SDB). Similarly, in a hospital-based study on children in India, it was found to be 42.7%, with 5.8% reporting presence of snoring.[5] Other sleep problems reported in both these studies included nocturnal enuresis, sleep talking, bruxism, nightmares, night terrors, sleepwalking, bedtime resistance, and insomnia. Despite the high prevalence in community studies, there is inadequate information on how many of them get to visit a paediatric pulmonologist or sleep specialist in India. The most common reason for children attending a paediatric sleep clinic in South Korea was found to be for SDB.[2] Paediatric polysomnographies performed in children in Singapore was predominantly for obstructive sleep apnea (OSA).[6] This study aims at describing the characteristics of patients

and the polysomnography findings in a dedicated sleep clinic in India.

MATERIALS AND METHODS

All patients with sleep problems between the age of 1 month and 18 years attending the paediatric sleep clinic at a tertiary care hospital in Bangalore, between January 2019 and February 2021 were assessed. All patients were evaluated using standardized sleep questionnaires. The brief infant sleep questionnaire was used in children less than 2 years and the paediatric sleep questionnaire in children above 2 years of age. Infants (between 0 and 2 years) with sleep issues underwent sleep coaching as per the "Naps and Nibbles Sleep Coaching Program," exclusively designed and customized by the hospital paediatric pulmonologist. Children are classified as those with either sleep associations or sleep resistance. Parents are then taken through a month long plan which includes establishing a sleep routine, eliminating sleep associations, managing night awakenings, and setting a nap schedule. The paediatric pulmonologist categorized children into those who required polysomnography and those who could be managed clinically. Level one paediatric polysomnography was conducted by an on-site trained sleep technician and interpreted by a paediatric pulmonologist. Studies were conducted using Philips Respironics Alice 6 equipment with channels measuring electroencephalography, electro-oculography, electrocardiography, chin electromyography (EMG), respiratory movements (thoracic and abdominal bands), airflow, oxygen saturation, carbon dioxide monitoring, microphone, leg EMG, and video monitoring. Sleepware G3 software was used for analysis. Scoring and diagnosis was performed as per the paediatric criteria of the American Academy of Sleep Medicine scoring manual 2007 (updated 2018).[7] OSA was categorized based on the apnea-hypopnea index (AHI) as mild (AHI <1), moderate (AHI 1–5), and severe (AHI >5). Children with moderate-to-severe OSA, with underlying neuromuscular or genetic conditions and/or associated hypoventilation on polysomnography were initiated on non-invasive ventilation.

Diagnosis of restless leg syndrome (RLS) in children was made in children who fulfilled the following criteria: (1) An urge to move the legs, usually accompanied or caused by uncomfortable and unpleasant sensations in the legs; (2) sleep disturbance not typical for age; (3) a biological parent or sibling with definite RLS; and/or (4) a polysomnogram (PSG) documenting a periodic limb movement index of 5 or more movements per hour of sleep.

RESULTS

One hundred and eighty-six children visited the sleep clinic for different sleep problems, of which 85 (45.6%) required a polysomnography. As shown in [Table 1], 68 infants (36.5%) were <2 years of age presenting with problems such as multiple night awakenings, difficulty in initiation of sleep, and reduced daytime naps. All children underwent sleep coaching as per the Naps and Nibbles Sleep Coaching program of which 62 (91.2%) children reported resolution of sleep symptoms on a follow-up of 1 month.

[Table 2] shows the results of the polysomnography studies of 85 patients. Of the 46 children referred for suspected OSA, 27 (58.7%) underwent sleep studies, 14 (30.4%) responded to the management of associated allergic rhinitis, and 5 (10.9%) were lost to follow-up. Among these patients, 12 (44.4%) demonstrated severe OSA and 4 (14.8%) had moderate OSA, 4 (14.8%) had mild OSA, 6 (22.2%) were normal studies, and 1 (3.7%) was an inadequate study. The study was labelled as inadequate as the child with underlying attention deficit hyperactivity disorder repeatedly pulled out the nasal and oral thermistor for more than 6 h of the sleep time. Twelve of the 16 patients with moderate-to-severe OSA underwent adenotonsillectomy. None of them showed any recurrence of symptoms or clinical signs on a 6-month follow-up, and hence, a repeat polysomnography was not done.

Of the 32 children with neuromuscular conditions who underwent PSG, 8 (25%) had mild OSA, 17 (53.1%) had

Table 1: Reason for visit/referral to the sleep clinic for sleep problems (*n*=186).

Condition	*n* (%)	Underwent polysomnography, *n* (% of condition)
Infant sleep issues	68 (36.5%)	0
Suspected OSA (in an otherwise normal child)	46 (24.7%)	27 (58.7%)
Neuromuscular conditions	34 (18.2 %)	32 (94.1%)
• Duchenne muscular dystrophy	12 (6.4%)	
• Spinomuscular atrophy/congenital myopathy	22 (11.8%)	
Genetic conditions	29 (15.6 %)	25 (86.2%)
• Down's syndrome	6 (3.2%)	
• Prader-Willi syndrome	14 (7.5%)	
• Mucopolysaccharidosis	6 (3.2%)	
• Smith-Magenis syndrome	1 (0.5%)	
	1 (0.5%)	
• Crouzon syndrome	1 (0.5%)	
• Osteogenesis imperfecta		
Parasomnias		0
• Nightmares/night terrors	8 (4.3%)	
Abnormal movements during sleep	1 (0.5%)	1 (100%)

Table 2: Results of the diagnostic paediatric polysomnography studies performed (*n*=85).

Outcome	Number (% of total studies performed) (%)
Normal study	8 (9.4)
Obstructive sleep apnea	74 (87.0)
· Mild (AHI 1–5)	13(15.2)
· Moderate (AHI 5–10)	36 (42.3)
· Severe (AHI >10)	25 (29.4)
Restless leg syndrome	1 (1.1)
Inadequate study	2 (2.3)

moderate OSA, 6 (18.7%) had severe OSA, and 1 (3.1%) was a normal study. Eighteen of them with moderate-to-severe OSA were initiated on CPAP/BiPAP, of which 16 of them underwent a titration study within the first 6 months of initiation, and CPAP/BiPAP pressures were adjusted accordingly. Twenty-nine children presented with an associated genetic syndrome, of which 25 (86.2%) underwent PSG, showing mild OSA in 1 (4%), moderate OSA in 15 (60%), severe OSA in 7 (28%) children, 1 (4%) normal study, and 1 (4%) inadequate study. Twenty of them were initiated on CPAP/BiPAP, of which six of them underwent titration studies within 6 months of initiation, and CPAP/BiPAP pressures were adjusted accordingly.

DISCUSSION

A higher number of parents were seen visiting the sleep clinic for infant sleep issues (36.5%) in comparison to other studies. This could be attributed to the dedicated and well-communicated infant sleep program of our sleep clinic. Infant sleep problems are, however, not rare in the community, with 66% babies between 1 and 23 months in China reporting a sleep problem, and 34% experiencing frequent night awakening.[8] Hence, infant sleep issues need to be recognized early, addressed by a paediatrician, referred to a sleep clinic if necessary, and started on a sleep coaching program.

Similar to studies in other countries, the largest group of patients referred to our sleep clinic was for suspected SDB (58.6%), including those with neuromuscular diseases and genetic conditions. This was also the most common indication for performing a polysomnography in our set-up. Children attending sleep clinics, like in our study as well, have other comorbid medical, genetic, neurological, and behavioural problems. Hence, this warrants the need for an interdisciplinary approach to paediatric sleep medicine and training of doctors in related disciplines.[9] Polysomnography plays a useful and critical role in the diagnosis of sleep disorders, initiation of CPAP/BiPAP, and for the titration of pressures in children with neuromuscular or genetic conditions.[10] Of the 85 studies, we had only 2 (2.3%), which were inadequate studies, similar to other centres.[6] Hence, polysomnography, if performed and interpreted by trained personnel, is not always challenging to perform in children, as commonly perceived by paediatricians.

This study is one of the first reports describing the spectrum of paediatric sleep disorders seen in children in India. The profile of cases seen in our exclusive paediatric sleep clinic is similar to those seen in other countries. There is an increasing need for paediatricians in India to hence recognize sleep problems in their daily practice and to be trained in the management of common sleep disorders. Sleep disorders left untreated can result in poor school performance and behaviour problems in children, with possible long-term consequences as seen in adults such as hypertension, dyslipidaemia, cardiovascular disease, obesity, metabolic syndrome, and type 2 diabetes mellitus.[11] More sleep clinics need to be established in different cities in India for paediatricians to be able to recognize and refer complex sleep-related problems for management and polysomnography when indicated.

CONCLUSION

Sleep issues are common in children and need to be addressed in a paediatric sleep clinic. This study aids a paediatrician to understand the spectrum of sleep disorders in children and indications for polysomnography.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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