



Original Article

Children's Sleep Disturbance Scale in Differentiating Neurological Disorders

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ABSTRACT

BACKGROUND: We use the Sleep Disturbance Scale for Children (SDSC) routinely as a tool for evaluating children's sleep quality in our pediatric neurology clinic. We analyzed its ability to detect sleep disturbances distinctive to selected neurological disorders. **PATIENTS:** One-hundred and eighty-six children (age range 2–18 years) who were evaluated by the SDSC questionnaire were divided into three groups according to their principal diagnosis: epilepsy, attention deficit hyperactivity disorder, or others. Their responses were analyzed. **RESULTS:** The average frequency of abnormal total sleep score was 26.9%. The most frequent sleep disorders were excessive somnolence (25.3%), initiating and maintaining sleep (24.7%), and arousal/nightmares (23.1%). There were no significant group differences for total scores or sleep disorder-specific scores; although a sleep–wake transition disorder was more frequent among children with epilepsy (31%). A literature search revealed that the frequency of abnormal total scores in several neurological disorders (e.g., epilepsy, cerebral palsy) ranges between 20% and 30%. **CONCLUSIONS:** The mechanism underlying sleep disturbances in many neurological disorders may be unrelated to that of the primary disease but rather originate from nonspecific or environmental factors (e.g., familial/social customs and habits, temperament, psychological parameters). Although the SDSC is noninformative for studying the effect of a specific neurological disorder on sleep, we still recommend its implementation for screening for sleep disturbances in children with neurological abnormalities.

Keywords: sleep disorders, epilepsy, attention deficit disorder with and without hyperactivity (ADHD), Sleep Disturbance Scale of Children (SDSC)

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Introduction

Sleep disturbances may be more common in children with neurological disorders compared with the normal pediatric population.^{1,2} They can affect daytime functioning of the child and have been described in attention deficit disorder with and without hyperactivity (ADHD).^{2,3} They were also found to be prevalent in epilepsy as well as in many neurogenetic syndromes, and are well known to accompany psychogenic/psychiatric disturbances.^{1,3} It is well accepted that sleep deprivation can negatively affect

the electrical activity recorded by electroencephalography and even influence seizure frequency.⁴ The evaluation of a child's quality of sleep is, therefore, an integral part of a comprehensive medical examination, especially in neurology. The Sleep Disturbance Scale for Children (SDSC) questionnaire⁵ is short and easily administered. We incorporate it as a routine part in the child's evaluation in our neurology clinic to detect and describe abnormal sleep patterns. We then looked at its potential ability to differentiate between neurological disorders. The present study summarizes our experience with the addition of this questionnaire into the battery of neurological evaluations and compares our impression of its value with the conclusions expressed in other reported studies.

Patients and Methods

All children aged 2 to 18 years who were seen between March and June 2010 at the Pediatric Neurology Clinic of Schneider Children's

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Medical Center of Israel, a tertiary university-affiliated pediatric hospital, were enrolled in the study. The patients or their parents were asked to evaluate the child's quality of sleep by filling in the SDSC questionnaire.⁵ The responses were reviewed for accuracy with the parents by the treating pediatric neurologist, after which they were entered into the research database. The children whose parents who were unable to fill the questionnaire because of language difficulties (e.g., proficient exclusively in Arabic or Russian) were excluded.

The questionnaire was divided into three major diagnostic categories, ADHD, epilepsy, and others (mostly headache, neurofibromatosis, cerebral palsy without epilepsy, and autistic spectrum disorder and single cases of other neurological diagnoses). The SDSC contains 26 items in a 5-point Likert-type scale (0 = least severe and 5 = most severe) divided into six sleep disturbance categories: (1) disorders of initiating and maintaining sleep (DIMS), (2) disorders of sleep-related breathing (SDB), (3) disorders of arousal (DA), (4) sleep-wake transition disorders (SWTD), (5) disorders of excessive somnolence (DOES), and (6) sleep hyperhidrosis (SHY). The sum of the scores for each specific sleep disturbance provides a total sleep score; a score >70 is considered as being pathological.

Statistical analysis

The data were analyzed using BMDP statistical software.⁶ The total sleep score as well as each of the six subscales were converted into binary variables based on a T score >70 (>95th percentile) and subsequently recoded as 0 or 1. Univariate associations between all the binary variables and gender, age, and neurological disorder were calculated using Pearson chi-square test or Fisher exact test, as appropriate. Crude odds ratios (OR) with 95% confidence intervals (CI) were extrapolated. A multivariate unconditional logistic regression was performed for the total sleep disturbance score as well as for each of the six subscales (both after having been recoded as being pathologic or nonpathologic). Because age contributed nothing to any of these analyses, it was subsequently omitted from the models. The level of significance was defined as 0.05. This study was approved by the Beilinson Hospital's Helsinki Committee on Human Experiments.

Results

The 186 study participants included 109 males (58.6%) and 77 females (41.4%) whose ages ranged from 2 to 18 years (mean 10.5 ± 4 years). The children were categorized according to their major neurological diagnosis: 62 had ADHD (33.3%), 58 had epilepsy (31.2%), and 66 had "other" neurological diagnoses (35.4%). The 66 children in the "others" group included 19 with headache, seven with neurofibromatosis, four with cerebral palsy without epilepsy, three with an autistic spectrum disorder, and 33 with a single neurologic pathology each (for example, one

child had Bell palsy). The most frequent sleep disorders were excessive somnolence (25.3%), initiating and maintaining sleep (24/7%), and arousal/nightmares (23.1%). Fifty children had a pathological total sleep score (Table 1).

Overall, there was no significant group difference in prevalence of a pathological total sleep score or of any specific sleep abnormality. The only significant findings were that SWTD was more frequent in children with epilepsy (OR = 2.48, 95% CI 0.99–6.23, $P = 0.06$) and in males (OR = 2.70, 95% CI 1.17–6.22, $P = 0.02$). Univariate and multivariate analyses demonstrated that a pathological total sleep score was significantly associated with male gender (OR = 2.22, 95% CI 1.09–4.50 $P = 0.03$), as was one of the specific sleep abnormalities (DIMS: OR = 2.05, 95% CI 0.98–4.31, $P = 0.06$). None of these analyses revealed any significant association among five sleep disturbance categories (DIMS, SBD, DA, DOES, and SHY) and any of the neurological disorders with which the study participants presented, except for SWTD, which was more frequent in children with epilepsy (OR = 2.48, 95% CI 0.99–6.23, $P = 0.06$ compared to children with ADHD and those with other neurological disorders).

Discussion

We report our experience with the SDSC questionnaire as a routine tool for the evaluation of sleep patterns and disturbances in our pediatric neurology clinic. There was no significant difference in the frequency of a pathological total score (>70) among the groups of children with ADHD, epilepsy, or other neurological diagnoses. The same held true for a pathological score for any of the specific sleep disorders, except for SWTD that was found to be more frequent in children with epilepsy compared with the other two groups. The questionnaire responses also indicated a tendency for increased frequency in male gender for the total pathological score, SWTD, and DIMS. Newman et al.⁷ also reported that SWTD affected males more than females in their study on children with cerebral palsy.

Overall, the questionnaire could be considered useful for the evaluation of sleep disorders in this pediatric patient population, even though it seems noncontributory for differentiating between sleep disorders that might be characteristic of a specific neurologic disorder. The frequency of pathological total scores was 27% in our study

TABLE 1.
Distribution of abnormal total sleep scores (>70) and different sleep disorders in the three study groups

	Total	SHY	DOES	SWTD	DA	SBD	DIMS
ADHD (n = 62)	16 (25.8%)	5 (8.1%)	15 (24.2%)	12 (19.4%)	11 (17.7%)	5 (8.1%)	15 (24.1%)
Epilepsy (n = 58)	18 (31%)	5 (8.6%)	17 (29.3%)	18 (31%)	18 (31%)	9 (15.5%)	18 (31%)
Others (n = 66)	16 (24.2%)	5 (7.6%)	15 (22.7%)	9 (13.6%)	14 (21.2%)	6 (9.1%)	13 (19.7%)
Total (n = 186)	50 (26.9%)	15 (7.6%)	47 (25.3%)	39 (13.6%)	43 (23.1%)	20 (10.8%)	46 (24.7%)

Abbreviations:

ADHD = Attention deficit disorder with and without hyperactivity

DA = Disorders of arousal

DIMS = Disorders of initiating and maintaining sleep

DOES = Disorders of excessive somnolence

Others = Headache, neurofibromatosis, cerebral palsy without epilepsy, autistic spectrum disorder, and 33 neurological pathologies diagnosed in one child each

SBD = Disorders of sleep-related breathing

SHY = Sleep hyperhidrosis

SWTD = Sleep-wake transition disorders

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