

Sleep duration in school-age children with epilepsy: A cross-sectional study

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ABSTRACT

Background: Normal sleep is required for the optimal growth and development of the children. Ineffective or inadequate sleep is common in children with epilepsy. **Objectives:** The objectives of this study were to study the sleep duration and describe the factors affecting it in school-aged children with epilepsy attending the seizure clinic of a pediatric tertiary care hospital. **Materials and Methods:** 6–12-year-old children with epilepsy, attending the seizure clinic formed the study subjects. They were assessed for inclusion in the study using INCLEN diagnostic tool for epilepsy (INDT-Epi) to achieve a sample size of 139. Informed written consent was obtained from parents. Background sociodemographic information, seizure type and treatment details, and duration of sleep of the child were collected from the parents. The proportion of children with epilepsy who had sleep problems were expressed as percentage. **Results:** The mean age of study population was 9.07 ± 2.09 years. The average sleep duration of the study population was 9.41 ± 1.41 h. The mean nap time of the study population was 68.51 ± 33.88 min. No significant association was seen among the factors that determine sleep duration. **Conclusion:** Children with epilepsy tend to sleep for lesser hours when compared to historic controls of normal school-age children reported in literature.

Key words: Children, Epilepsy, Sleep duration

Sleep is a physiological state of rest associated with complete relaxation of skeletal muscles and decreased conscious activity [1]. Normal sleep is required for the optimal growth and development of all children. It promotes attention span, improves mental well-being, and improves memory, and thereby learning. The American Academy of Sleep Medicine recommends 9–12 h of sleep on a regular basis in children 6–12 years of age to promote well-being [2]. Sleep disorders are common in all age groups; however, ineffective or inadequate sleep is more common in children with epilepsy [3]. The prevalence of sleep disorder in children with epilepsy ranges from 10% to 33% [4]. It is also known that sleep, especially the non-rapid eye movement (REM) stage, is associated with increased epileptiform discharges [5]. Seizures can disrupt sleep structure, particularly the REM sleep, and it has been shown that severity of sleep disturbance is directly proportional to the severity of epilepsy [5]. Certain types of seizures such as frontal lobe seizures, parietal lobe seizures, tonic seizures, and tonic-clonic seizures are seen mostly during sleep [6]. Antiepileptic drugs (AED) can also affect sleep, particularly the soundness of sleep and sleep latency [6]. This study was undertaken to determine the sleep duration in children with epilepsy and the factors that affect it. The objectives of our study are to find the sleep duration in school-aged children with epilepsy and to describe the factors affecting sleep duration in them.

MATERIALS AND METHODS

This study was conducted in the Department of Pediatrics, in a Tertiary Care Medical College Hospital of Puducherry, between June and August 2015. Children with epilepsy, attending the seizure clinic formed the study subjects. The study was approved by our Institute Human Ethics Committee. All children aged 6–12 years with epilepsy attending the seizure clinic were assessed for inclusion in the study to achieve a sample size of 139 children with epilepsy. The sample size was calculated using OpenEpi based on 10% prevalence of sleep disorder in children with epilepsy reported in literature [4], 5% confidence limits and a design effect of one using the formula $n = [DEFF * Np(1-p)] / [(d^2 / Z_{1-\alpha/2}^2 * (N-1) + p * (1-p)]$.

Inclusion Criteria

School-aged children (6–12 years of age) with epilepsy diagnosed using INCLEN diagnostic tool for epilepsy. This tool has a high validity for the diagnosis of epilepsy when used by primary care physicians [7].

Exclusion Criteria

Exclusion criteria were children with developmental delay, mental retardation, and neuromotor impairment. Children not accompanied by at least one responsible parent.

After satisfying the inclusion and exclusion criteria, a total of 140 children were enrolled for the study. Informed written consent was obtained from parents of children and assent was obtained in a child who was above 8 years of age. Background information of the child in terms of age, sex, locality, parental literacy, socioeconomic status, duration of illness, type of seizures, frequency of seizures, duration of anticonvulsant therapy, number of anticonvulsants, and comorbid conditions was collected from the medical record and interview of parent and children who meet the inclusion criteria for study. The parent was then questioned about the duration of sleep and daytime sleepiness.

Sleep duration was expressed as mean and standard deviation. The proportion of children with epilepsy who have sleep problems were expressed as percentage. The factors associated with sleep duration were compared using *t* test for continuous variables and Chi-square test or Fisher's exact test for categorical variables. All statistical tests were done using QuickCalcs Graph Pad software.

RESULTS

A total of 174 school-aged children (6–12 years) attending the pediatric seizure clinic of a tertiary care teaching hospital of south India were screened for the presence of epilepsy with the INCLIN diagnostic tool for epilepsy (INDT-EPI tool). Of the 174 children screened, 140 were found to have epilepsy and were included for the study. The mean age of study population was 9.07 ± 2.09 years. Male children comprised 58.57% of the study population. More than 95% of these children belonged to rural background. The majority of them (57.86%) belonged to lower middle socioeconomic class according to modified Kuppaswamy scale. Majority of the study population (83.57%) had generalized seizures. The median duration of epilepsy was 36 months with an interquartile range of 12–60 months. The majority of these children (82.85%) had <1 seizure per month. Most of these children (70.71%) were on a single AED. The complete list of background study characteristics is given in Table 1.

The average sleep duration of the study population was 9.41 ± 1.41 h. The mean nap time of the study population was 68.51 ± 33.88 min. Sleep duration was longer in children older than 9 years, females, children belonging to upper lower socioeconomic class, children with mixed seizure type, children on polytherapy, and children with duration of therapy longer than 2 years. However, none of the above was statistically significant (Table 2). The mean nap time, on the other hand, was higher in children younger than 9 years, male children, children belonging to upper middle class, children with generalized seizures, children with frequent seizures, children on polytherapy, and duration of treatment longer than 2 years. As in the case of sleep duration, none of the above measures were statistically significant (Table 3).

DISCUSSION

The mean duration of sleep in children with epilepsy found in this study is less when compared to 10.32 ± 1.18 reported by

Table 1: Background characteristics of the study subjects

Variables	Values
Mean age in years (SD)	9.07 (2.09)
Sex	
Male (%)	82 (58.57)
Female (%)	58 (41.43)
Locality	
Rural (%)	134 (95.71)
Urban (%)	6 (4.29)
Socioeconomic status	
Upper (%)	0
Upper middle (%)	57 (40.71)
Lower middle (%)	81 (57.86)
Upper lower (%)	2 (1.43)
Lower (%)	0
Type of seizures	
Generalized (%)	117 (83.57)
Partial (%)	19 (13.57)
Mixed (%)	4 (2.8)
Duration of epilepsy in months median (IQR)	36 (12–60)
Seizure control	
<1/month (%)	116 (82.85)
1 or >/month (%)	24 (17.15)
AED	
Monotherapy (%)	99 (70.71)
Polytherapy (%)	41 (29.29)
Sleep duration	
Average sleep duration (h)	9.41 (1.41)
Mean nap time (min)	68.51 (33.88)

AED: Antiepileptic drugs, IQR: Interquartile range, SD: Standard deviation

Bharti *et al.* in their study on normal school going children in India [8]. Similarly, Batista and Nunes also found that children with epilepsy have greater incidence of sleep problems compared to the normal children [9]. In our study, we find that the duration of sleep was longer for children older than 9 years compared to younger children with epilepsy. This finding is similar to a study by Sheares *et al.*, who found that sleep problems were more prevalent in early school-aged children than previously recognized [10]. However, this finding is in contrast to that of Gradisar *et al.* according to which adolescents sleep for lesser duration [11]. According to their study, adolescents, especially Asian adolescents spend less time in sleep compared to American and European peers and, have more daytime sleepiness [11].

In our study, the mean sleep duration was less in upper middle and lower middle groups as compared to upper lower group, but it was not statistically significant. This may be due to the fact that higher socioeconomic status children may be exposed to more television viewing or other screen time which predispose them to less sleep. Results similar to our study have also been found by Bapat *et al.* in their study on 268 schoolchildren from Pune [12]. The mean night sleep duration was less and nap time was more

Table 2: Factors affecting sleep duration in children with epilepsy

Factors	Average sleep duration (h)	P
Age (years)		
≤9	9.37 (1.39)	0.7390
>9	9.45 (1.44)	
Sex		
Male	9.38 (1.47)	0.7414
Female	9.46 (1.32)	
Socioeconomic status		
Upper middle	9.47 (1.32)	0.7413
Lower middle	9.35 (1.48)	
Upper lower	10 (1.41)	
Seizure type		
Generalized	9.44 (1.42)	0.5448
Partial	9.13 (1.08)	
Mixed	9.88 (2.53)	
Seizure frequency		
<1/month	9.46 (1.37)	0.3943
≥1/month	9.19 (1.59)	
AED therapy		
Mono	9.35 (1.38)	0.4239
Poly	9.56 (1.48)	
Duration of epilepsy		
≤24 months	9.34 (1.22)	0.6223
>24 months	9.46 (1.54)	

No significant difference in sleep duration was noted among the subgroups described above. AED: Antiepileptic drugs

in children with frequent seizures (more than one episode per month) compared to those who had fewer seizures in our study. Similar observations were also found by Batista and Nunes [9] and Cortesi *et al.* [13]. According to Cortesi *et al.*, duration of illness, seizure frequency, and behavioral problems were significantly associated with sleep problems in the epileptic group [13]. In our study, the nap time was found to be higher for boys than girls and for upper middle and lower middle class compared to upper lower socioeconomic class but was not statistically significant. In a study by Weissbluth, no difference was found for nap pattern based on the gender [14]. There was higher nap duration (daytime sleepiness) among children with epilepsy who were on polytherapy and those with the duration of epilepsy more than 2 years, which is similar to that reported in literature in earlier studies [9,13,15].

Our study had few limitations. First, a case–control design could not be performed, and therefore, our results were compared to the earlier published studies. This study was conducted on children with epilepsy belonging predominantly to rural areas and low-to-medium socioeconomic status. Actigraphy was not performed to correlate actual sleep with reported sleep, and there could be bias in reporting sleep timing based on which sleep duration is calculated. The results of the study, therefore, need to be interpreted in light of the above statements.

Table 3: Factors affecting nap time in children with epilepsy

Factors	Average nap time (min)	P
Age (years)		
≤9	51.04 (41.03)	0.9675
>9	50.75 (43.78)	
Sex		
Male	53.42 (42.10)	0.4222
Female	47.63 (41.66)	
Socioeconomic status		
Upper middle	53.68 (44.55)	0.7487
Lower middle	49.26 (40.41)	
Upper lower	37.5 (31.82)	
Seizure type		
Generalized	50.77 (41.35)	0.8608
Partial	53.68 (44.25)	
Mixed	41.25 (56.62)	
Seizure frequency		
<1/month	48.88 (41.07)	0.2120
≥1/month	60.63 (45.21)	
AED therapy		
Mono	50 (40.60)	0.6964
Poly	53.05 (45.26)	
Duration of epilepsy		
≤24 months	47.07 (41.43)	0.3653
>24 months	53.60 (42.23)	

No significant difference in nap time was noted among the subgroups described above. AED: Anti-epileptic drugs

CONCLUSION

Children with epilepsy sleep for lesser hours when compared to normal school-age children, and therefore, improving quality of sleep should also be one of the management principles for children with epilepsy. Frequent seizures, prolonged epilepsy duration, and polytherapy show a tendency toward poor sleep quality; however, we could not find any significant association among them. Further studies may be required to confirm the same.

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