

Prevalence of Sleep Disorders in Epileptic Children Admitted in Ali-Asghar Hospital

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Abstract

Background: Epilepsy is a common neurological disorder in children and adolescents, and it may have an interaction with sleep disorders. Co-occurrence of these two diseases may worsen the quality of life and may even interfere with seizure control. This study was performed to determine the prevalence of sleep disorders in children with seizures.

Methods: This study was conducted as a cross-sectional study. A total of 104 children with seizures who referred to the Neurology Clinic of Ali Asghar children's Hospital from September 2018 to September 2019 were enrolled the study. Demographic information and clinical findings of patients including age, sex, age of onset of seizures, body mass index, EEG changes, brain imaging findings, type of drug consumption, seizure type, seizure refractory and underlying disease were recorded in a checklist. Then, the CSHQ sleep habits questionnaire for children was completed. The collected data were analyzed using SPSS software version 26. **Findings:** Generally, when renal function decreases, sex hormones, hypothalamic-pituitary axis and thyroid function is commonly disrupted. The mechanisms of endocrine disorders in these patients is complex and including impaired hormonal feedback, abnormal production of hormones and disrupting hormone transmission and connect them to the receptor.

Results: The children's mean age was 5.06 ± 2.56 year. Of cases, 71 (67.3%) were male. There was sleep disorders in 87 (83.7%) of cases. There was no significant difference between sleep disorders with gender, seizure type and refractoriness, EEG and brain imaging findings, single or multidrug use and underlying diseases. It showed a significant relationship of patient's age, age of onset of seizures and body mass index with sleep disorders.

Conclusion: In this study, the prevalence of sleep disorders in children with seizures was high. It seems that sleep disorders has an important relationship with epilepsy and should be evaluated.

Keywords: Children, Seizure, Sleep Disorders, CSHQ

Introduction

Convulsion is a common neurological problem in the childhood period due to abnormal discharges of brain neurons which leads to abrupt motor, sensory and behavioral changes. Epilepsy refers to recurrent seizures without any causative factors including fever,

trauma, metabolic and electrolyte imbalances. The prevalence of epilepsy in children is 1% and according to studies in Iran, this rate is 1.8%. There are some comorbidities associated with epilepsy includes learning, emotional, concentration and sleep difficulties (1, 2).

Studies have demonstrated a reciprocal relationship between sleep and epilepsy. Sleep disorders are more common in epileptic patients and seizure disorders have effect on sleep quality that may be related to physiology of sleep and pathological mechanisms of epilepsy. Insufficient sleep is common in epileptic patients and this is either due to the nature of seizures and its treatment or associated sleep disorders. Epilepsy can lead to poor parent-child relationship, disrupted sleep, daytime sleepiness, and consequently results in impaired memory, concentration and daily functioning(3,4).

Sleep is consisting of two main stages: non rapid eye movement (NREM), and rapid eye movement (REM) sleep. Depending on the sleep stage, brain electrical waves can change and become activated in some patients. Usually more epileptic waves are produced during NREM sleep and in contrast, there are asynchronous neuron discharges in REM that is less epileptic. Many sleep-related epilepsies start in childhood period. In the children population, more common epilepsies that are related to sleep include benign epilepsy with Centro-temporal spike waves with orofacial presentation in the night (Rolandic seizure), myoclonic epilepsy of adolescents with hand jerky movements or even tonic-clonic seizure after awakening (Janz syndrome) and Landau Kleffner syndrome with continuous abnormal waves during the sleep, which is associated with cognitive and psychological problems (5).

About the effect of epilepsy on sleep, it might be said that seizure also damages sleep structure and leads to instability, disintegration and reduction of REM duration as well as sleep fragmentation (5).

A part of sleep disorders in epileptic patients, is related to anticonvulsant drugs, regarding their types, amount and duration of their use. Benzodiazepines and phenobarbital relax the respiratory muscles and disrupt responses to increased carbon dioxide and reduced oxygen saturation. Sodium valproate can also have an adverse effect on sleep by creating weight gain. Simultaneous use of multiple drugs may lead to parasomnia disorders (6,7).

There are some sleep disorders in epileptic patients which can present as a respiratory problem including obstructive sleep apnea (OSA), which also damages sleep structure and decrease its quality (8).It is necessary to discover and treat OSA in epileptic child with accurate history taking and polysomnography.

Epilepsy is associated with several psychiatric problems such as cognitive,behavioral and emotional disorders that affect sleep. It means that, epileptic patients are at risk of depression and anxiety, which also adversely affects sleep patterns (9).

It is worthy to say that, evaluation of sleep problems may help to better management of children with seizure disorders and this study

was designed to determine the prevalence of sleep disorders in children with seizures.

Method and Materials

This cross-sectional study was conducted on 104 children with seizure disorders who referred to neurology clinic from September 2018 to September 2019 in Ali Asghar Children Hospital. At first, researcher got an ethic committee permission (code:IR.IUMS.FMD.REC.1398.174). Then demographic and other patient's characteristics included age, sex, height and weight for measuring body mass index (BMI), age onset of seizure, seizure type (generalized vs focal), seizure refractoriness, abnormal findings in electroencephalography (EEG) and brain imaging was recorded in a researcher – made check list. Child sleep habits questionnaire (CSHQ) was filled by the researcher after interviewing with the parents. Data were recorded in prepared checklists. Finally, the collected data were analysed by SPSS 26 software.

Measuring the patient's weight was done by a nurse with a digital scale in the clinic (with a thin cloth and without shoes), based on kilograms (accuracy of ± 100 gram). Patients' height was measured by a plastic meter. Body mass index (BMI) was calculated by division of body weight (kg) by height square (m^2). For each case, BMI was calculated based on World Health Organization tables of age and

sex. Percentiles less than 5 as underweight, 5-85 as normal weights, 85-95 as overweight and above 95 as obesity were considered.

CSHQ is a questionnaire and has 45 items that is filled by parents about child sleep problems. According to Owen scoring, it decreased to 35 more important items (11). It included eight main items which were completed by questioning parents and their evaluation from children's sleep pattern during the past week. Parents had three options to choose for each of the questions: usually (5-7 nights per week), sometimes (2-4) nights per week and rarely (0-1 nights per week). Score up to 41 was considered as normal and more than 41 as sleep disorders.

About seizure type it was divided to groups including focal-which a part of body such as one hand or foot, was involved the seizure activity- and generalised that all part of the body was involved. Monotherapy means one antiepileptic drug and polytherapy is two or more drug consumption. Refractory seizure means fail of seizure control with 2 traditional antiepileptic drugs (phenobarbital) in addition of one new generation drugs (lacosamide).

The main items are including: 1. Resistance of sleep time, itself has 6 sub-branches such as going to bed at a specified and fixed time. 2. Delayed sleep onset time including: starting

sleep in more than 20 minutes. 3. The duration of the sleep that it has three sub-branches, such as very short sleep. 4. Sleep anxiety with 4 sub-branches such as asking the child for parental presence in the bedroom 5. Frequent night awakenings include 3 subcategory such as going to bed with other family members at night. 6. Parasomnia with 7 sub-branches such as nocturnal enuresis. 7. Respiratory diseases in sleep with 3 sub-branches such as snoring and puffiness. 8. Daytime sleepiness with 8 sub-branches such as inability to wake up on their own. At the same time, the total score of sleep disorders can be obtained by this questionnaire, according to the main questionnaire designed by Owen et al. In this test, Cronbach's alpha was 0.78 in the sample of clinic. Higher scores indicated more sleep problem (11). Its validity and reliability was proved by Iranian researchers (12,13).

Results

In this cross sectional study, 104 epileptic patients with age of 2 to 17 year old enrolled. Mean age was 5.06 ± 2.56 year. Of 104 cases, 71 (67.3%) were male. There was sleep disorders in 87 (83.7%) of cases.

About sleep disorders, resistance to go to bed in 98 (94.2%) patients, shorter duration of sleep in 58 (55.7%) cases, problem for starting sleep more than 20 minutes in 57 (54.8%) cases, sleep anxiety in 84 (80.8%) cases, recurrent awaking during the night in 30 (28.8%) cases,

parasomnia in 17 (16.3%) and daily sleepiness in 93 (89.4%) of patients was seen. Most of cases had sleep disorders as a rarely or sometimes problem. In respiratory problem during sleep, 10 (9.5%) cases have mild problem and only one case had sleep apnea that was referred to otolaryngologist.

There was no significant difference between sleep disorders with gender, focal or generalized seizures, different type of seizure and being refractory, EEG and brain imaging findings, using of single or multi antiepileptic drugs. Abnormal brain imaging findings (in magnetic resonance imaging) was detected in 23 cases including brain atrophy (6 cases), sequel of trauma (6 cases), meningitis (3 cases), stroke (3 cases), hypoxic-ischemic encephalopathy (3 cases), cytomegalo-virus infection (one case) and Lissencephaly (one case). There was a significant relationship of age, age of onset of seizures and body mass index with sleep disorders. It means that sleep disorders was more prevalent in patients who were younger, had lower age when seizure started and were with higher BMI (table 1). Prevalence of sleep disorders has shown in figure 1.

Table1: Demographic and seizure characteristics of the patients

Variables		Sleep disorder		p-value
		No N=17(16.3%)	Yes N=87(83.7%)	
Mean age	5.06±2.56	7.11±3.55	4.63 ±1.99	0.002
Mean age of onset of seizure (year)	1.75± 1.41	3.40±2.50	1.43±0.77	0.000
Gender	Male	12(11.5%)	59(56.7%)	0.1
	Female	5(4.8%)	28(27%)	
BMI	Normal	14(13.5%)	55(53%)	0.000
	underweight	3(3%)	0	
	Overweight	0	23(22%)	
	Obesity	0	9(8.5%)	
Seizure type	Generalized	16(15.5%)	76(73)	0.3
	Focal	1(1%)	11(10.5%)	
Refractory seizure	Yes	5(5%)	10(9.5%)	0.07
	No	12(11.5%)	77(74%)	
Medication	Monotherapy	13(12.5%)	78(75%)	0.13
	Polytherapy	4(4%)	9(8.5%)	
EEG findings	Mild	14(13.5%)	76(73%)	0.4
	Moderate	3(3%)	11(10.5)	
Brain imaging findings	Abnormal	6(6%)	17(16.5%)	0.1
	Normal	11(10.5)	70(67%)	

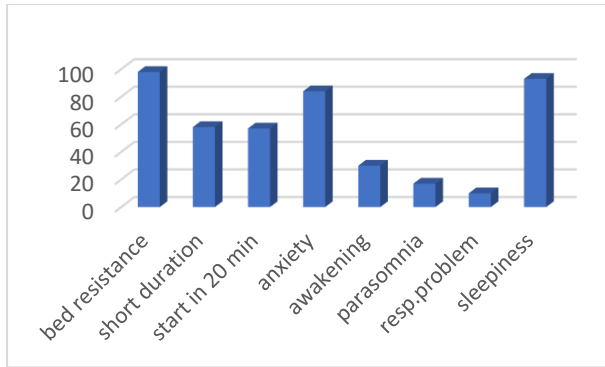


Fig1: prevalence of sleep disorders in patients

Discussion

The aim of this study was to investigate the prevalence sleep disorders in children with seizures. For this purpose, children's sleep habits questionnaire for 104 children with seizure was completed through parental statements and compared with their clinical findings.

Our study showed a high prevalence of sleep disorders in epileptic children which had significant relationship with BMI, age and age of onset of seizure.

In this study, like the results of Ozgoli and Liu studies (13, 14) the child's age had a significant relationship with sleep disorder. However, there was no significant relationship between sleep quality and age in Gharamaleki et al. study (15). Study population and the use of different tools may be the reason for this difference.

In the present study, sleep disorder had a significant relationship with BMI, Arman et al. achieved the same result and in their study concluded that there was a significant

relationship between sleep quality and body mass index (16). Bagly et al. also confirmed in their study the relationship between sleep quality and body mass index (17). Chaput in another study showed there was a significant relationship between sleep disorder and the incidence of obesity in children (18).

In our study, the frequency of sleep disorder among children with seizures was 83.7%, indicating that sleep disorders is high in children with seizures. In many studies, similar results have been obtained, and especially in studies which sleep disturbances was compared between healthy and seizure-affected groups, it concluded that sleep disorder is more prevalent in patients with epilepsy than healthy children (19-21).

In present study, sleep disorders was seen in patients with higher BMI. Hasler et al. also found a significant relationship between sleep disorder and weight gain in children (22). Inadequate sleep affects children's health and weight, although the cause is not known accurately, but in many studies, it has been proven that sleep disorder and body mass index are correlated (23,24).

In the Arhan et al. study (25) that compared sleep disturbances in 3 groups of children with refractory epilepsy, children who had recently had a diagnosis of epilepsy and healthy children. The results of their study, as in the present study, showed that children with seizures suffer from more sleep disorders than healthy children. Arhan concluded that children with refractory epilepsy had a

significant decrease in sleep time, total sleep time, effective sleep, and a significant increase in wakefulness, waking up after bedtime, and periodic foot movement compared to the healthy group and newly diagnosed epilepsy group. Children with refractory epilepsy had the highest total score of the CSHQ questionnaire, while children with newly diagnosed epilepsy had higher scores than healthy children (25). In the present study, the prevalence of sleep disorders in children with seizures is high, but in our study this rate has not been compared with healthy children. Our limitation was small sample size, incomplete filling of check lists, parents non-cooperation.

Conclusion

In this study, the prevalence of sleep disorders in children with seizures was investigated and the results showed that the prevalence of sleep disorders in children with seizures is high and has a significant relationship with higher body mass index, younger age and lower age of onset of seizure. It is recommended that regular assessment of sleep disorders may help doctors to increase sleep quality in children with seizures.

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Conflicts of interest: The authors declare that they have no conflicts of interest.

References:

1. Dehghani M , Fayyazi A , Cheraghi F , Hakimi H , Mosazadeh S, Almasi S. The Relationship between Severity of Epilepsy and Sleep Disorder in Epileptic Children. Iran J Child Neurol. Spring 2019; 13(2): 77-88
2. Minardi C,Minacapelli R,Valastro P , Vasile F ,Pitino S, Pavone P,Astuto M ,Murabito P. Epilepsy in Children: From Diagnosis to Treatment with Focus on Emergency. J. Clin. Med. 2019;39(8):1-10
3. Cortesi F, Giannotti F, Ottaviano S. Sleep problems and daytime behavior in childhood idiopathic epilepsy. Epilepsia. 1999;40(11):1557-65.
4. Al-Biltagi MA. Childhood epilepsy and sleep. World journal of clinical pediatrics. 2014;3(3):45-53.
5. Lanigar S, Bandyopadhyay S. Sleep and epilepsy: a complex interplay. Missouri medicine. 2017;114(6):453-457
6. Kothare S V,Kaleyias J.Sleep and epilepsy in children and adolescents. Sleep Medicine. 2010; 11:674–685
7. Jain SV,Glauser TA.Effects of epilepsy treatments on sleep architecture and daytime sleepiness: An evidence-based review of objective sleep metrics. Epilepsia.2014; 55(1):26–37
8. Malow BA, Levy K, Maturen K, Bowes R. Obstructive sleep apnea is common in medically refractory epilepsy patients. Neurology. 2000;55(7):1002-1007. doi:10.1212/wnl.55.7.1002
9. Holley S, Whitney A, Kirkham F, Freeman A, Nelson L, Whitlingum G, et al. Executive function and sleep problems in

- childhood epilepsy. *Epilepsy & Behavior*. 2014;37:20-5.
10. Reilly C, Atkinson P, Memon A, Jones C, Dabydeen L, Cross JH, et al. Child and parental sleep in young children with epilepsy: A population-based case-control study. *Epilepsia open*. 2018;3(3):383-91.
11. Owens JA, Spirito A, McGuinn M. The Children's Sleep Habits Questionnaire (CSHQ): psychometric properties of a survey instrument for school-aged children. *Sleep*-New York-. 2000;23(8):1043-52.
12. Fallahzadeh H, Etesam F, Asgarian FS. Validity and reliability related to the Persian version of the Children's Sleep Habits Questionnaire. *Sleep and Biological Rhythms*. 2015;13(3):271-8.
13. Ozgoli G, Sheikhan Z, Soleimani F, Nasiri M, Mirzaee S, Kavousi F, et al. A Study of Effective Factors on Sleep Disorders in 4-6 Years old Children in Tehran City, Iran. *Qom University of Medical Sciences Journal*. 2015;9(5):50-60.
14. Liu X, Liu L, Owens JA, Kaplan DL. Sleep patterns and sleep problems among schoolchildren in the United States and China. *Pediatrics*. 2005; 115(Supplement 1):241-9.
15. Gharamaleki AS, Hoseini SM, Zamani A, Vaezzadeh F, Djafarian K. Sleep pattern in 6-9 years old students living in Tehran city. *J Isfahan Med School* 2011; 29(154):1221-8. [Full Text in Persian].
16. Arman AR, Ay P, Fis NP, Ersu R, Topuzoglu A, Isik U, et al. Association of sleep duration with socio-economic status and behavioural problems among schoolchildren. *Acta Paediatrica*. 2011;100(3):420-4.
17. Bagley SL, Weaver TL, Buchanan TW. Sex differences in physiological and affective responses to stress in remitted depression. *Physiology & behavior*. 2011;104(2):180-6.
18. Chaput J-P, Tremblay A. Does short sleep duration favor abdominal adiposity in children? *International Journal of Pediatric Obesity*. 2007;2(3):188-91.
19. Lima BS, Zokaei A, Assarzadegan F, Hesami O, Shahamati SZ. Prevalence of sleep disorders in patients with epilepsy: A questionnaire-based cross-sectional study. *Epilepsy & Behavior*. 2020;107 635.
20. Borusiak P, Bast T, Kluger G, Weidenfeld A, Langer T, Jenke AC, et al. A longitudinal, randomized, and prospective study of nocturnal monitoring in children and adolescents with epilepsy: effects on quality of life and sleep. *Epilepsy & Behavior*. 2016;61:192-8.
21. Manni R, Terzaghi M. Comorbidity between epilepsy and sleep disorders. *Epilepsy research*. 2010;90(3):171-7.
22. Hasler G, Buysse DJ, Klaghofer R, Gamma A, Ajdacic V, Eich D, et al. The association between short sleep duration and obesity in young adults: a 13-year prospective study. *Sleep*. 2004;27(4):661-6.
23. Najafian J, Mohammadifard N, Dana SZ, Sadri GH, Ramezani M, Nouri F. Association between sleep duration and body mass index and waist circumference. *IJMS*. 2010;35(2):140-4.
24. Ochiai H, Shirasawa T, Shimada N, Ohtsu T, Nishimura R, Morimoto A, et al. Sleep duration and overweight among elementary schoolchildren: a population-based study in Japan. *Acta Medica Okayama*. 2012;66(2):93-9.
25. Arhan E, Uçar HK, Aydın K, Hirfanoğlu T, Serdaroglu A. How do children with drug-resistant epilepsy sleep? A clinical and video-PSG study. *Epilepsy & Behavior*. 2020:1