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PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.1401207>Available online at: <http://www.iajps.com>**Research Article****EPILEPSY, ATTENTION DEFICIT HYPERACTIVITY  
DISORDER AND SLEEP DISORDER IN CHILDREN**<sup>1</sup>Dr. Adnan Zafar, <sup>2</sup>Dr. Abeera Yaseen, <sup>3</sup>Dr. Hassan Sharif<sup>1</sup>MO, BHU Santal, Gujrat.<sup>2</sup>WMO, BHU Chokar Khurd, Gujrat.<sup>3</sup>MO, BHU 50/12L, Chichawatni, Sahiwal.**Abstract:**

*This study examines the affiliation between epilepsy, ADHD (attention deficit hyperactivity disorder) and sleep disorder. PubMed database search is the base of this article. While using the PubMed database search, 85 articles have been located and for abstract reading 30 articles were selected. Similarly, 10 articles were selected for review with the core purpose to analyze epilepsy, ADHD and sleep disorder relationship on different grounds such as epidemiology, comorbidities effects specifically on academic functioning and those aspects which lead to diagnosing the hindrances among mentioned above three disorders.*

*Several hindrances were there to initiate and maintain sleep in epilepsy and ADHD patients, the patients have a diminution in their sleep efficacy, patients of both group faced declined seizure verge with cognitive and behavioral deficits. The important thing in the research is to distinguish the "prime symptom" and for this purpose, both adolescents and children suffered from epilepsy, attention deficit hyperactivity disorder and sleep disorder essentially need to analyze very carefully before starting any treatment. This study concluded that an important relationship is there in this pathological triangle.*

**Keywords:** *Epilepsy, Attention Deficit Hyperactivity Disorder, sleep disorder*

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**INTRODUCTION:**

In medical studies, the quality of sleeping practices, specifically in newborns and adolescents considered the most deliberate subject. It is also believed that several pathologies can indicate better architecture alterations of sleep. Epilepsy is basically a chronic disorder, through which patient has unprovoked frequent seizures, both Epilepsy and ADHD, attention deficit hyperactivity disorder are comprised in between the most predominant diseases (Beattie et al., 2016).

The syndromes of epilepsy may cause circadian rhythm variations which perform the hypothalamus, simply directing changes in cortical excitability, further subsequently in the expression of seizure. This seizure expression and patterns may disturb by the sequences of sleep and vice versa (Bessey, Coulombe and Corkum, 2013).

Attention deficit hyperactivity disorder is high predominant psychiatric comorbidity in the patients with epilepsy; it may clearly observe when 70% patients' symptoms achieved. ADHD high-frequency symptoms further aggravate significantly the psychosocial diagnosis. Furthermore, 55%-75% parents describe alteration in sleep quality at their adolescents. In the patient of ADHD, the sleep disorders' disease mechanism remains uncertain and appears to be multifactorial. Several complaints are extended sleep potential and sleep continuance (DIAMOND, 2005).

Several studies recommend that ADHD is commonly concomitant with childhood epilepsy. A specific study by Bessey, Coulombe, and Corkum (2013) signifies that ADHD is importantly more dominant in fresh onset epilepsy rather than healthy groups (31% Vs 6%). In several cases mostly children are featured primarily by distracted irregularities and through onset predating the epilepsy diagnosis.

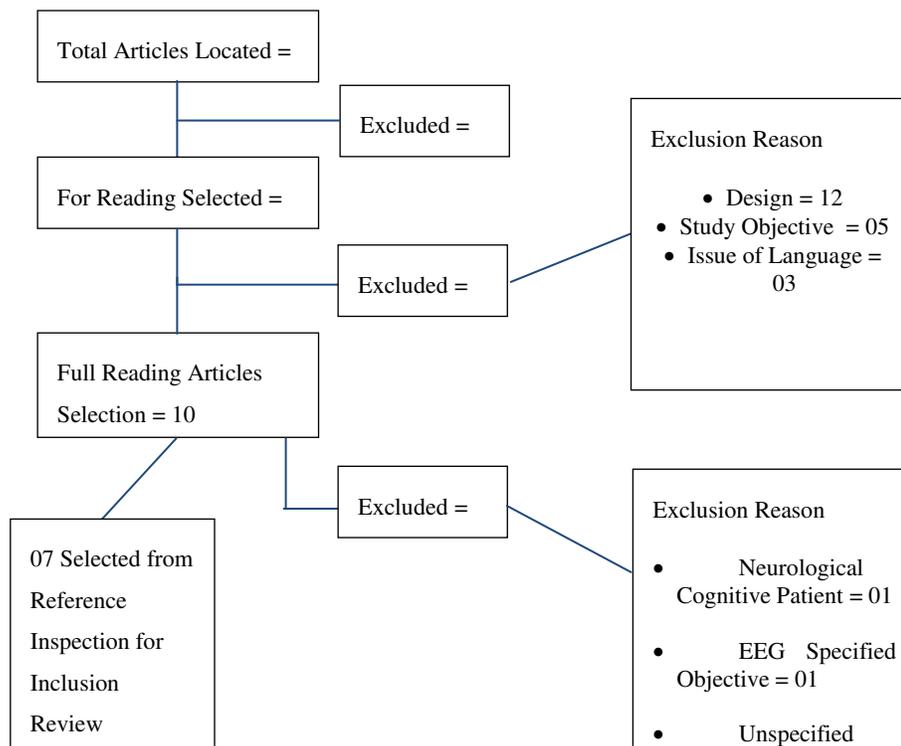
Exploring the views of Neto, Noschang, and Nunes (2016), it is observed that childhood ADHD specifically associated with underachievement in

education and there are several neuropsychological concerns with variance in implementing the function. Epilepsy and ADHD both are linked with a sleep disorder, an academic diversity, behavioral complications, and social hindrances and cognitive which predate major epilepsy onset. The rational Magnetic Resonance Imaging of ADHD patients, those who also affected by epilepsy, represents augmented grey matter significantly in the front lobe and significantly lesser brainstem. These hindrances seem to be linked with irregularities of neurodevelopment in the structure of the brain.

According to the explanation of Hung (2016) there are inconsistent verdicts which require a better understanding. Researchers empirically measures, by "actigraphy" for children sleep along with epilepsy together with healthy regulators. After measures, researchers did not discover any alteration in both group sleep measures. Furthermore, important shortfalls in cognitive execution were proved which were not described by sleep alterations. As there are multiple arguments for epilepsy and ADHD and sleep triumvirate it develops relevance to comprehend this research paper. This research paper's main objective is to perform epilepsy, ADHD and sleep disorders relationship. This research paper also tries to cover diagnosis, clinical features, treatments, and comorbidities. Similarly, this research paper gives an additional proof based information in clinical decision support.

**Bibliographic Research & Method**

This research review was carried out by exercising a protocol based PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) statements. This literature search was accomplished in three months from the database of PubMed. The through the reading of study and its evaluation also lead to access to other publications; through that, it was possible to comprise further new references in this paper (Hvolby, 2014). The basic process of exploration, collection and articles exclusion is shown in below mentioned Fig. 01



**Figure 01: Exclusion and Article Selection Procedure | Source: (Neto, Noschang and Nunes, 2016)**

Most of the epileptic patients experience multiple alterations in sleep macrostructure, which mostly reflected in sleep efficacy decline, the rise in duration and number of nocturnal awakening with severely amplified sleep inception latency and shattering of REM (rapid eye movement) sleep. For instance, BECTS, a common childhood epileptic syndrome, through which predominantly attack happens during sleep. As there are different examples of epileptic syndromes: directly or indirectly related to sleep; renowned “American Academy of Sleep Medicine” generates a specific term “SRE” (Sleep Related Epilepsy), to entitle those epilepsies where the seizures happen more than 70% through sleep. Patients with stubborn and generalized epilepsy supposed to have more abnormalities during sleep. Another fact also ignored that sleep problems make multiple changes in the behavior of epilepsy patients (Mao and Yang, 2016).

Researchers also observed that the quality of sleep in ADHD patients, diagnosed with actigraphic and through parental reports. Similarly, as per reports, a

case based study was planned, where 206 children of 5 to 11 years of age were investigated. The selected numbers of ADHD children were 45, children from other psychiatric group were 64 and numbers of healthy children were 97. According to result, it was analyzing that ADHD patients have longer sleep onset expectancy (26.3 min) with highly uneven patterns of sleep associated with both other groups; psychiatric 18.3 min and healthy 13.5 min). The researcher concluded that ADHD affected children have more disturbed sleep which may not justify through the disorder of comorbid oppositional defiant (Kanazawa, 2014).

On the contrary, Gruber et al., through actigraphic monitoring study for more than five sequential nights. In the study, the number of selected participants was 38 and all were school going boys, but having ADHD diagnosed. Similarly, the second group consisted of 64 control school going boys. The researcher observed a highly unstable sleep onset and duration in the group of ADHD as compared to the second group of controlled boys. According to these

findings, it is again supported that ADHD children have unstable sleep as compared with others (Neto, Noschang and Nunes, 2016).

In another reviewing study, researchers analyzed 97 children's sleep; aged 3 to 18 years identified ADHD. Accordingly, 36% patients who experience PLMD "polysomnography periodic limb movement disorders" have also been monitored, while in sixteen patients, specifically examined by actigraphy also observed a considerable adaptability each night on overall sleep latency and time. According to the major analysis of this research paper, there is a high pervasiveness of the complaints of subjective sleep in the ADHD children's parents. These patients also have experience of restless sleep, issues of maintaining sleep and daytime drowsiness (Welch et al., 2016).

Furthermore, according to the analysis of ADHD etiology, specifically in epilepsy, the highest indication which symptoms of deficit attention are not tributary components associated with epilepsy, is the deficits symptoms presence particularly in responsiveness which precedes the inception of epileptic disease with latest analysis cryptogenic or idiopathic epilepsy. Both epilepsy pervasiveness of ADHD is mainly 2.5 times complex as compared to the previous one (Reilly, 2011).

As per the description of Beattie et al. (2016) ADHD comorbidities were evaluated and for that purpose 68 total adolescents and children were engaged (4-6

years of age preschool children were 9, 7 – 12 years age elementary school children were 50 and 13-19 years of age adolescents were also 9: according to this calculation the "mean age: 9.7 years). Below 4 years of mental age patients and for those who have below or equal to 50 IQ level were also omitted. After an investigation in 36 cases, there was no comorbidity recognized, though in many cases comorbid disorders were identified. Along with these all cases, only two had sleep disorders, like sleepwalking and night terrors; accordingly, there was epilepsy in 5 cases: one is the frontal lobe and the other two not diagnosed.

According to the views of Sharecare (2018), it found that ADHD affected children and epileptiform nocturnal activity disclosed to a center of epilepsy. The abovementioned study was prospective which 6 to 14 years old children and based on 362 patients with normal intellectual performance and epilepsy, among these 46 was mentioned with a credible ADHD diagnosis. 43 patients were using anti-epilepsy drugs and 30 had verdict ADHD. Furthermore, 7 out of ADHD 30 children have focal nocturnal epileptiform. The ration of ADHD patients was quite higher as compared to the rate reported in patients with the latest seizures diagnosis, but on the contrary lower with some other tertiary centers. The major finding of this study showed the incidence of activities of subclinical epileptiform in 24 hours, full EEG (Electroencephalography) recording in epilepsy and ADHD affected children.

Age range	n	Main objective	Findings	Conclusions
6-14 years	46	- Determine relationship between ADHD and quantity of focal nocturnal epileptiform activity (FNEA)	- FNEA present in 7/30 ADHD patients	- No possible causal effect of FNEA on ADHD
3-10 years	17	- Avoid aggressive therapies in BECTS, ESES and academic difficulties	- High SWI and ADHD prevalence	- Formal psychological evaluation is the most important parameter to use a new AED
3-14 years	196	- Delineate the frequency of atypical features of BECTS	- 61 had ADHD - 9 had ESES	- Prevalence of atypical forms of BECTS is low, but ADHD is high
2-18 years	186	- Detect sleep disturbances applying SDSC	- 50 children had abnormal sleep score	- Sleep disorders mechanisms may not be related to primary disease
4-19 years	68	- Comorbidity in ADHD	- 5 had epilepsy - 2 sleep disorders	- Multiple comorbid disorders in several cases
-	134	- EEG abnormalities	- 38 BECTS - All presented spike/ wave at some time	- EEG discharges are related to neuropsychiatric symptoms
8,9 (mean Age)	42	- Prevalence of IED and seizures in ADHD children	- 86% sleep disorders	- Seizures/IED have important role on cognitive abilities and ADHD
	38	- Analyze features, treatment and outcome of MEI	- 53,1% had IEDs - 4 learning disabilities (two ADHD)	- Good outcome in terms of seizure control and neuropsychological profile
5-11 years	206	- Actigraphic and parental reports of sleep difficulties in ADHD	- ADHD had longer sleep onset latency	- Discrepancy between objective sleep analysis and subjective reporting of parents
-	102	- Compare sleep-wake system of ADHD with controls	- Increased sleep onset and duration in ADHD	- Instability of sleep-wake system in children with ADHD
3-18 years	97	- Sleep in ADHD with PSG	- 36% PLMD  - Variability in total sleep time and latency	- High prevalence of subjective sleep complaints among parents of children with ADHD
7-11 years	82	- Compare ADHD sleep/sleepiness to control		- Both groups can have difficulties to start and maintain sleep, by different mechanisms

Source: (Neto, Noschang and Nunes, 2016)

On the same ground and subject 78 female and 118 male patients, with BECTS were analyzed and monitored for 40 months (with a range of 2-11). All patients had diagnosed epilepsy between 3 to 14 years. 78 persons practiced a convulsion seizure in monitored period. Regression levels were demonstrated by the decline of IQ in 4 patients, ADHD in 5 and language worsening in 4 and aggressive behavior in 3 patients. Nine children established ESES "electrical status epileptics in slow waves sleep". There is ADHD in 61 children, cognitive deficits in 43 patients and behavioral aggression in 23 patients. Overall this study supported the ADHD high occurrence between the patients of BECTS (Bessey, Coulombe and Corkum, 2013).

### DISCUSSION:

Several studies are available in the literature stipulating the sleep/ADHD epilepsy relations which still threatened. ADHD (attention deficit hyperactivity disorder) is a syndrome commonly known as a neuropsychiatric syndrome. It is basically depicted by an obstinate attention lack of

hyperactivity pattern, extra severe and recurrent than analyzed in a similar group of age. The prevalence differs from 3.5% to 19% as per analytic criteria utilized. Attention deficit hyperactivity disorder is highly based upon data scales and clinical symptoms (here example of data scales is SNAP-IV Form) which determine the personal characteristic and important losses in the behavior of the child in multiple situations. There is also a consent that is not essential the use of any typical approach to analyzing the ADHD, as discussed in the abovementioned table 01 (Welch et al., 2016).

In different researches about 25% to 50% of adolescents and children, also have ADHD, show disturbances in sleep. These also incorporate nocturnal attentions sleep delay phases, insomnia, and amplified nocturnal activity. Most of the children demonstrate the important commitment to sleep both in questionnaires (subjective) and actigraphy (objective) measure. Similarly, 55% to 74% of ADHD patients' parents indicate multiple sleep complaints in their adolescent or child. However, a sufficient analysis and treatment can boost the

development in life quality of these children and adolescents. The supreme epilepsy occurrence in infancy and it disturbs 0.5% to 1% of children. Epilepsy affected children demonstrate commitment in cognitive sleep and function and life quality (Zucconi, 2013).

### CONCLUSION:

In epileptic patients, ADHD is utmost predominant psychiatric comorbidity. Specifically in stubborn cases, where there are 60% to 70% symptoms clearly presented in children or adolescents. In children affected with epilepsy, the excessive prevalence of ADHD symptoms further worsens considerably the psychosocial scenario, in most cases when discussing the caregiver burdens. Similarly, sleep can trigger the seizures' occurrence and the abnormalities of electroencephalogram (EEG). Researchers refer that in the period of NREM "non-rapid eye movement" discharges of sleep are assisted in synchronized EEG patterns. Accordingly, in the period of suppression occurrence at REM "rapid eye movement" sleeps. This process makes problems of ejections to the patterns of desynchronized.

The sleep effect, specifically in the syndromes of epilepsy, is most common and well known, as represented in benign epilepsy with BECTS. It is usually familiar that deprivation of sleep may be liable for the activity of epileptiform; therefore it still alive in the discussion if it happens secondary to neuronal excitability. Epilepsy can particularly disturb the patterns of sleep for both adolescent and children. Parents also have multiple sleep issues with epilepsy patient as they frequently share the room with their children. There is a need that clinicians have also pay attention to parents and not only be concentrating on patients sleep disorders in epilepsy.

### REFERENCES:

1. Beattie, J., Koch, S., Bolden, L. and Thompson, M. (2016). Neuropsychological consequences of sleep disturbance in children with epilepsy. *Epilepsy & Behavior*, 57, pp.118-123.
2. Bessey, M., Coulombe, J. and Corkum, P. (2013). Sleep Hygiene in Children with ADHD: Findings and Recommendations. *The ADHD Report*, 21(3), pp.1-7.
3. DIAMOND, A. (2005). Attention-deficit disorder (attention-deficit/ hyperactivity disorder without hyperactivity): A neurobiologically and behaviorally distinct disorder from attention-deficit/hyperactivity disorder (with hyperactivity). *Development and Psychopathology*, 17(03).
4. Hung, K. (2016). Epilepsy in Children with ADHD. *Epilepsy Journal*, 02(04).
5. Hvolby, A. (2014). Associations of sleep disturbance with ADHD: implications for treatment. *ADHD Attention Deficit and Hyperactivity Disorders*, 7(1), pp.1-18.
6. Kanazawa, O. (2014). Reappraisal of abnormal EEG findings in children with ADHD: On the relationship between ADHD and epileptiform discharges. *Epilepsy & Behavior*, 41, pp.251-256.
7. Mao, S. and Yang, R. (2016). Parents' emotional status, ADHD symptoms and sleep problems in children with epilepsy. *Seizure*, 42, p.57.
8. Neto, F., Noschang, R. and Nunes, M. (2016). The relationship between epilepsy, sleep disorders, and attention deficit hyperactivity disorder (ADHD) in children: A review of the literature. *Sleep Science*, 9(3), pp.158-163.
9. Reilly, C. (2011). Attention deficit hyperactivity disorder (ADHD) in childhood epilepsy. *Research in Developmental Disabilities*, 32(3), pp.883-893.
10. Sharecare. (2018). *The Surprising Connection Between Epilepsy and ADHD*. [online] Available at: <https://www.sharecare.com/health/epilepsy-and-seizures/article/epilepsy-ADHD-connection> [Accessed 9 Aug. 2018].
11. Welch, V., Petticrew, M., Petkovic, J., Moher, D., Waters, E., White, H., Tugwell, P. and the PRISMA-Equity Bellagio group (2016). Extending the PRISMA statement to equity-focused systematic reviews (PRISMA-E 2012): explanation and elaboration. *Journal of Development Effectiveness*, 8(2), pp.287-324.
12. Zucconi, M. (2013). Nocturnal frontal lobe epilepsy: a sleep disorder rather than an epileptic syndrome?. *Sleep Medicine*, 14(7), pp.589-590.