

Original Article

Excessive Daytime Sleepiness And Sleep Issues Among Patients With Epilepsy: A Cross-Sectional Study At A Tertiary Care Hospital, Islamabad

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Abstract

Objective: To determine the frequency of excessive sleep disorders and associated risk factors in patients with epilepsy presenting at the neurology department of the Federal Government Polyclinic Hospital.

Methodology: A cross-sectional study was conducted at the Department of Neurology to enrol participants aged 18–90 years with a confirmed clinical diagnosis of epilepsy for at least one year. Sociodemographic variables (age, sex, residence, and occupation) and clinical characteristics (epilepsy type, age at diagnosis, disease duration, seizure frequency, time since the last seizure, and history of nocturnal seizures) were collected using a structured form. Excessive daytime sleepiness was assessed using the Epworth Sleepiness Scale.

Results: There were 150 patients with epilepsy, of whom 78 (52.0%) were men and 72 (48.0%) were women. The mean age was 34.6±14.6 years. Mild-to-moderate excessive daytime sleepiness was found in 42 (28.0%) patients, while severe excessive daytime sleepiness was found in 10 (6.7%) patients with epilepsy. The major risk factors associated with excessive daytime sleepiness included a greater number of drugs taken ($p<0.001$), seizure frequency ($p=0.013$), compliance with medication ($p<0.001$), use of topiramate ($p=0.004$), and use of valproic acid ($p<0.001$).

Conclusion: The findings indicate a high occurrence of excessive daytime sleepiness among patients with epilepsy in Pakistan. A significant association was observed between excessive daytime sleepiness and a greater number of drugs taken, seizure frequency, compliance with medication, and use of topiramate and valproic acid.

Keywords: Epilepsy, excessive daytime sleepiness, sleep disorders, anti-epileptic drugs, quality of life, Epworth sleepiness scale

Introduction

Epilepsy is a serious neurological disease that affects approximately 70 million individuals worldwide. It is a multifaceted neurobehavioural and social condition that frequently occurs alongside other medical or psychological conditions, which may reduce an individual's overall quality of life.¹ Epilepsy is characterised by a wide array of symptoms, including staring, jerky movement of legs and arms, unconsciousness, difficulty in breathing, uncontrolled bowel or bladder, and seizures. Its aetiology is multifactorial, involving a combination of genetic, structural, metabolic, immune, and infectious causes, with genetic predisposition being among the most common.²

Sleep disturbances are frequently reported among individuals with epilepsy, with nearly one-third experiencing seizures during sleep.³ This occurs because sleep and epileptic seizures are closely interconnected, with changes in sleep influencing the underlying processes that trigger seizures. Multiple factors contribute to sleep disorders in people with epilepsy, including seizure frequency, medication adherence, occupational stressors, and polytherapy regimens.⁴

The impact of epilepsy on sleep may result from the same underlying biological mechanisms responsible for epilepsy, the direct effects of seizures, the effects of anti-epileptic medications, or a combination of these factors.⁵ Research has shown that individuals with epilepsy often experience several sleep disturbances, including longer

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Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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time to fall asleep, increased periods of wakefulness during the night, greater instability of sleep stages, increased light sleep (N1 and N2 non-rapid eye movement sleep), reduced sleep spindle activity, and decreased rapid eye movement (REM) sleep.^{6,7} Seizures occurring during sleep can further disrupt sleep quality by reducing REM sleep and overall sleep efficiency while increasing the proportion of light sleep. Additionally, many patients experience excessive sleepiness following a seizure (postictal hypersomnolence), which, in some cases, may persist for more than a day.⁸ Among other sleep disorders, the literature reported that excessive daytime sleepiness, also known as hypersomnia, is one of the most common sleep disorders prevalent among patients with epilepsy. Excessive daytime sleepiness means regularly napping during the day or falling asleep during the day, and then sleeping long hours at night.⁹ A review reported that the prevalence of excessive daytime sleep was observed in at least 10.0% of all epileptic patients with epilepsy.¹⁰ Literature also reports that excessive daytime sleep is usually related to age, seizure control, and use of first-line antiepileptic drugs that have sedative side effects. As excessive daytime sleep doubles the risk of intensified seizure frequency and disease progression in patients with epilepsy,⁹ there is a need to explore the frequency of sleep disorders among patients with epilepsy to manage their disturbed sleep, which would ultimately enhance their prognosis, disease management, and overall health.

There is limited literature from Pakistan exploring the frequency of excessive sleep disorder among epileptic patients and the related risk factors. We aimed to assess the frequency of excessive sleep disorders and associated risk factors in patients with epilepsy presenting at the neurology department of the Federal Government Polyclinic Hospital. This will provide insight into the gravity of the problem and highlight the importance of screening patients with epilepsy for sleep disorders, which are often overlooked and can result in intensified seizures.

Methodology

A cross-sectional study was conducted in the Department of Neurology at the Federal Government Polyclinic Hospital, Islamabad. ChatGPT Plus (OpenAI) was used solely for language refinement to improve the clarity and readability of the manuscript. The authors have reviewed and approved all content and take full responsibility for the manuscript. The manuscript was drafted according to STROBE (Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines. A total of 150 participants were consecutively recruited. The sample size was based on an assumed 10.0% prevalence of excessive daytime sleepiness,¹⁰ among patients with epilepsy, with a 95% confidence level, 80% power, and a 5% margin of error.

Participants were recruited from the outpatient department of the Neurology Unit. The inclusion criteria comprised adults aged between 18 and 90 years who had a clinical diagnosis of epilepsy confirmed at least one year before study enrolment based on the International League Against Epilepsy (ILAE) guidelines. Patients with all types of seizures (e.g. focal and generalised), on antiepileptic drug therapy (monotherapy or polytherapy), and with a documented record of seizure frequency were eligible for inclusion. Patients were excluded if they had a primary diagnosis of another sleep disorder (including insomnia, obstructive sleep apnoea, restless leg syndrome, or narcolepsy) or if they were diagnosed with other serious neurological conditions such as stroke, brain tumours, or neurodegenerative diseases that could independently affect sleep. Further exclusion criteria included severe mental health illness (including schizophrenia or major depression), active substance abuse or dependency (including sedatives or stimulants), recent changes in antiepileptic medication within the past three months, severe cognitive impairment precluding accurate reporting or questionnaire completion, and being pregnant.

Following approval from the Institutional Review Board, all eligible participants provided formal consent. Written informed consent was obtained before enrolment. Each participant underwent an initial clinical assessment and a neurological examination. Sociodemographic data, including age, sex, residence, and occupation, were recorded using a structured data collection form. Clinical information was also obtained, including epilepsy type, age at diagnosis, disease duration, seizure frequency, time since the last seizure, and history of nocturnal seizures.

To assess excessive daytime sleepiness, participants were asked relevant questions included in the ESS questionnaire.¹¹ A validated translated version in the local Urdu language was used in this study.¹² The ESS provides a quantitative measure of sleep propensity, with scores ranging from 0-24. A score of 0-7 indicated a low probability of sleepiness, a score of 8-9 indicated normal sleepiness, a score of 10-15 indicated mild to moderate sleepiness, whereas a score of 16-24 indicated excessive sleepiness. The total ESS score was used to evaluate the presence and severity of sleepiness in the study population.

For this study, the data were analysed using IBM SPSS Statistics software (23.0). Continuous variables such as age, disease duration, age at diagnosis, and ESS score were described in terms of means and standard deviations, and categorical variables such as gender, residence, occupation, seizure frequency, and presence of excessive daytime sleepiness were presented as frequencies and percentages. The prevalence of excessive daytime sleepiness among patients with epilepsy was calculated and reported as a percentage. To assess associations, the chi-square test was

applied to evaluate the relationships between excessive daytime sleepiness (four subcategories) and seizure control, as well as other grouping variables. Mean ESS scores across binary categorical variables were assessed using an independent samples t-test, while one-way analysis of variance (ANOVA) was employed for comparisons across variables with more than two categories.

Results

A total of 150 patients with epilepsy were enrolled and analysed. Of the 150 participants, 78 (52.0%) were men, and 72 (48.0%) were women. The mean age was 34.6 ± 14.6 years, with the lowest age being 14 years and the highest being 70 years, and the age range was 56 years. There were 44 (29.3%) participants with employment status, while 40 (26.7%) were unemployed/retired. Table 1 summarises the baseline characteristics.

Table 1: Summary of baseline characteristics of patients with epilepsy (n=150)

Demographic characteristics	Frequency (%)
Age	
Mean age	34.6 ± 14.6
Minimum age	14
Maximum age	72
Age groups	
<18 years	14 (9.3%)
18-35 years	78 (52.0%)
36-55 years	40 (26.7%)
56-75 years	18 (12.0%)
Gender	
Male	78 (52.0%)
Female	72 (48.0%)
Clinical characteristics	
Type of epilepsy	
Generalized	100 (66.7%)
Focal	44 (29.3%)
Complex partial	6 (4.0%)

The majority of the participants, 100 (66.7%), were diagnosed with generalised epilepsy, 44 (29.3%) had focal epilepsy, and 6 (4.0%) had complex partial epilepsy. The mean age at epilepsy diagnosis was 22.1 ± 15.8 years, with the minimum age at diagnosis being at birth and the maximum age being 63 years. Overall, the mean duration

of epilepsy was 145.6 ± 120.6 months, with a minimum of 11 months and a maximum of 504 months (42 years). Majority of the participants, 74 (49.3%), were taking two anti-epileptics drugs, 62 (41.3%) participants were on a single anti-epileptic drug, while 12 (8.0%) and 2 (1.3%) were on a combination of three and more than three antiepileptic drugs, respectively. The details of the anti-epileptic drugs taken by the participants are shown in Figure 1. There were 122 (81.3%) participants who were compliant with anti-epileptic medication, while 28 (18.7%) were non-compliant.

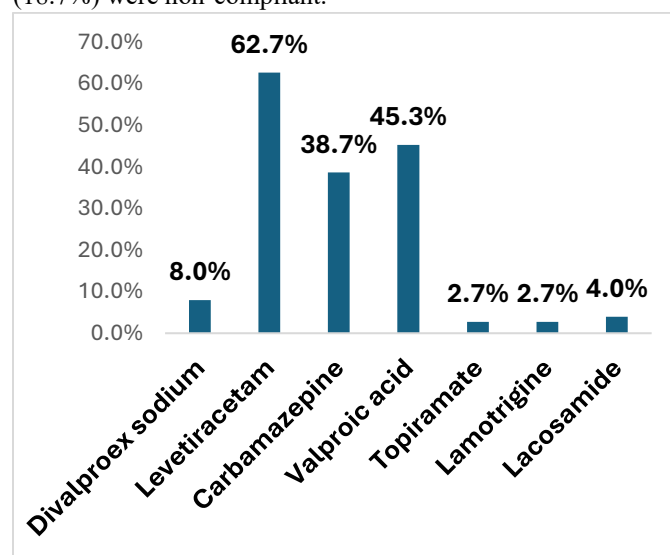


Figure 1: Distribution of anti-epileptic drugs prescribed to patients with epilepsy

In terms of seizure control, which was defined as no seizure episode within the last 12 months, 48 (32.0%) participants had controlled status, while the majority, 102 (68.0%), had uncontrolled seizures. Of the 102 participants, 38 (37.3%) experienced seizures after more than a month, 42 (28.0%) experienced seizures once per month, 16 (10.7%) once per week, and 6 (4.0%) once per day.

Regarding sleeping patterns, 28 (18.7%) participants reported a sleep duration of less than 6 h, 42 (28.0%) reported a sleep duration of 6-8 hours, and the majority, 80 (53.3%), reported a sleep duration of 8-10 hours. Majority, 62 (41.3%) of the participants, reported going to bed around 10:00 pm, followed by 30 (20.0%) who reported going to bed around 11:00 pm, 14 (9.3%) around 12:00 am, 20 (13.3%) around 09:00 pm while and 10 (6.7%) before 09:00 pm. Smartphone use before going to bed was reported by 84 (56.0%) participants, while 38 (25.3%) were using

sleep medications. There were 56 (37.3%) participants who reported frequent awakening during sleep at night. Around 88 (58.7%) reported feeling tired despite adequate sleep after awakening in the morning.

A summary of the findings from the Epworth Sleepiness Scale is presented in Table 2. The scores were categorised into various classes defining the level of sleepiness, where the majority, 74 (49.3%), were found to have a low probability of excessive daytime sleepiness, 24 (16.0%) had average daytime sleepiness, and 42 (28.0%) and 10 (6.7%) had mild-to-moderate and severe excessive daytime sleepiness, respectively, as shown in Figure 2.

Table 2: Summary of responses to Epworth Sleepiness Scale questionnaire (n=150)

	0	1	2	3
Sitting and reading	80 (53.3%)	18 (12.0%)	30 (20.0%)	22 (20.0%)
Watching TV	88 (58.7%)	28 (18.7%)	10 (6.7%)	24 (16.0%)
Sitting, inactive, in a public place (e.g., in a meeting, theater, or dinner event)	114 (76.0%)	12 (8.0%)	14 (9.3%)	10 (6.7%)
As a passenger in a car for an hour or more without stopping for a break	34 (22.7%)	38 (25.3%)	32 (21.3%)	46 (30.7%)
Lying down to rest when circumstances permit	32 (21.3%)	12 (8.0%)	28 (18.7%)	78 (52.0%)
Sitting and talking to someone	138 (92.0%)	0 (0%)	10 (6.7%)	2 (1.3%)
Sitting quietly after a meal without alcohol	48 (32.0%)	24 (16.0%)	28 (18.7%)	50 (33.3%)
In a car, while stopped for a few minutes in traffic or at a light	90 (60.0%)	32 (21.3%)	18 (12.0%)	10 (6.7%)

*0=Would never nod off, 1=Slight chance of nodding off, 2=Moderate chance of nodding off, 3=High chance of nodding off

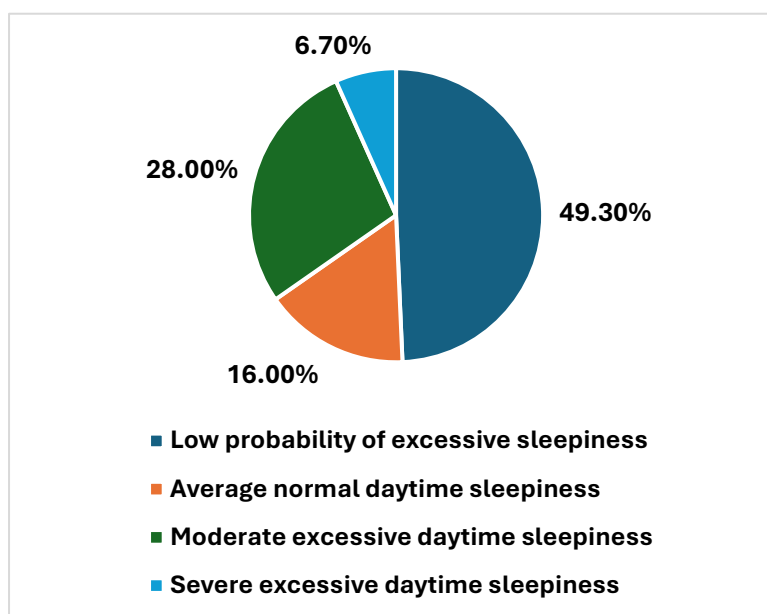


Figure 2: Percentage of patients with epilepsy experiencing different levels of excessive daytime sleepiness (n=150)

The levels of sleepiness were compared with various demographic and clinical characteristics of the patients. No significant association was observed between the level of daytime sleepiness and sex ($p=0.127$), type of epilepsy ($p=0.383$), seizure control ($p=0.301$), sleep duration ($p=0.141$), time to bed ($p=0.118$), smartphone use before going to bed ($p=0.127$), taking sleep medications ($p=0.285$), or frequent awakening at night ($p=0.093$). A significant difference was observed between the levels of daytime sleepiness and the number of drugs being taken ($p<0.001$), seizure frequency ($p=0.013$), and compliance with medication ($p<0.001$). Patients who were taking more than three

anti-epileptic drugs were found to have severe excessive daytime sleepiness compared to those who were taking a single anti-epileptic drug (100% vs. 6.5%, $p<0.001$). Patients who experienced frequent seizure episodes were found to have moderate and severe excessive daytime sleepiness compared to those with less frequent seizure episodes ($p=0.013$). Patients who were compliant with anti-epileptic medications more frequently reported moderate and severe excessive daytime sleepiness compared to those who were non-compliant with prescribed medications ($p<0.001$).

In terms of comparison between drugs and levels of excessive daytime sleepiness, participants who used topiramate were more likely to have severe excessive daytime sleepiness than those who did not use topiramate ($p=0.004$), and those who used valproic acid were found to have severe excessive daytime sleepiness compared with those who did not use valproic acid ($p<0.001$). In contrast, lamotrigine and lacosamide were less likely to be associated with excessive daytime sleepiness.

Discussion

The occurrence of sleep disorders was quite common in the study population. Sleep disorders are known to influence overall quality of life and can lead to poor medication compliance. This study aimed to assess the prevalence of excessive daytime sleepiness in patients with epilepsy and to identify the associated risk factors. Mild-to-moderate excessive daytime sleepiness was found in 42 (28.0%) patients, while severe excessive daytime sleepiness was found in 10 (6.7%) patients with epilepsy. The major risk factors included a greater number of drugs being taken ($p<0.001$), seizure frequency ($p=0.013$), compliance with medication ($p<0.001$), and use of topiramate ($p=0.004$) and valproic acid ($p<0.001$).

A review conducted by Bergmann et al., which included 25 studies, analysed 2964 patients with epilepsy and 5232 controls and reported that sleep-related problems were significantly more common among patients with epilepsy than in normal controls, and that sleep quality was significantly compromised in patients with epilepsy compared to controls.¹³

Tanveer et al. from Pakistan studied 200 patients with epilepsy and compared the results with those of 51 healthy individuals. It was reported that 65% of the patients with epilepsy had poorly controlled seizures, approximately 40% had moderate or severe excessive daytime sleepiness assessed by the Epworth sleepiness scale, and 71% had poor quality of sleep.¹⁴ These results are quite similar to the results reported in the current study, where 62.7% were found to have uncontrolled seizures, and 34.7% of patients with epilepsy had moderate or severe excessive daytime sleepiness. Zaccara et al. summarised in a review that among antiseizure medications, lamotrigine, lacosamide, and eslicarbazepine are considered to have a lower sedative profile and are therefore less likely to exacerbate excessive daytime sleepiness.¹⁵ Similar results were reported in the current study, where conventional drugs, including valproic acid ($p<0.001$) and topiramate ($p=0.004$), were more likely to cause excessive daytime sleepiness than newer drugs, lacosamide and lamotrigine.

Another study by Chang et al. was conducted in Malaysia to identify the prevalence and predictors of daytime sleepiness and poor quality of sleep in patients with epilepsy. The authors included 284 patients with epilepsy in the study and reported that severe excessive daytime sleepiness was prevalent in 6.0% of the patients, while poor sleep quality was prevalent in 27.5% of the patients. Carbamazepine and topiramate drugs and female gender were significantly associated with excessive daytime sleepiness.¹⁶ On the other hand, in our study, the prevalence of excessive daytime sleep was found to be higher as compared to what was reported by Chang CS et al.; similarly, we did not find an association between excessive daytime sleep and gender as the authors reported. These differences may be attributed to variations in population dynamics.

Our study revealed a high prevalence of sleep disorders in patients with epilepsy. These results underscore the importance of incorporating objective sleep assessments to facilitate early detection of sleep disturbances in this population. The observed association between epilepsy and EDS has significant implications for clinical practice and future research. Furthermore, the data highlight the need for increased clinical attention to the recognition and management of sleep disorders in individuals with epilepsy.

Conclusions

The findings indicate a high prevalence of excessive daytime sleepiness among patients with epilepsy in Pakistan. A significant relationship was observed between excessive daytime sleepiness and a greater number of drugs taken, seizure frequency, compliance with medication, and use of topiramate and valproic acid. These results underscore

the need to integrate the identification and management of sleep disorders into routine clinical consultations to improve overall health outcomes in patients with epilepsy.

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All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

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