Sleep Science and Practice

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Poor sleep hygiene practice and associated factors among adults with epilepsy attending follow up care at Mettu Karl comprehensive specialized hospitals in Illu Ababora Zone and general hospital in Buno Bedele zone, Southwest Ethiopia'

Tesfaye Segon[1*], Mamaru Melkam[2], Techilo Tinsae[2], Girum Nakie[2], Tirusew Wondie[3], Endris Seid[4] and Girum Tareke Zewude[5]

Abstract

Background Globally, sleep disorders are an important global public health problem. Poor sleep hygiene is at the core of chronic insomnia and other sleep disorders. Sleep hygiene practices are effective, practical, and affordable, and have no side effects other than other therapies benefiting patients with epilepsy. However, there is no research regarding sleep hygiene practice and its awareness among people with epilepsy in Ethiopia. This study aimed to assess sleep hygiene practice and its factors in patients with epilepsy.

Methods An institutional-based cross-sectional study was conducted. The study included 424 participants selected through systematic random sampling. An interviewer-administered Sleep Hygiene Index (SHI) questionnaire was used to collect data.The collected data was analyzed using SPSS Version 25.0. Bi-variable and multi-variable analyses were conducted to identify factors related to poor sleep hygiene.

Results The frequency of poor sleep hygiene practice among people with epilepsy was 59.5%. Non-adherence to AED (AOR = 1.86, 95% CI: 1.13, 3.23), depression (AOR = 2.10, 95% CI: 1.42, 4.21), poor sleep quality (AOR = 5.7, 95% CI: 3.12, 10.01), anxiety (AOR = 2.71, 95% CI: 1.67, 4.82), and current alcohol drinkers (AOR = 1.74, 95% CI: 1.27, 3.13) were associated with poor sleep hygiene practice.

Conclusion and recommendation The perception of sleep hygiene practice among patients with epilepsy was poor. Non-adherence to AED, depression, poor sleep quality, anxiety, and current use of alcohol were associated with poor sleep hygiene practices. Therefore, regular screening, sleep issue management, and expanded mental health support are crucial. Training programs and awareness strategies to improve sleep hygiene are highly recommended. Professionals should incorporate sleep hygiene in epilepsy care.

Keywords Sleep hygiene practice, Epilepsy, Anti-epileptic drugs, Ethiopia

*Correspondence:
Tesfaye Segon
tesfayes721@gmail.com
Full list of author information is available at the end of the article

Background

In recent years there has been increased attention and interest in poor sleep habits (Malarvili et al. 2022). Poor sleep hygiene practices are a compensatory response to sleep problems or disorders such as self-medicating with alcohol, smoking, increased use of caffeine for daytime sleepiness, and practicing behaviors that inhibit sleep (Cohrs et al. 2014). Lack of knowledge on proper sleep hygiene contributes to poor sleep practices, which subsequently affects the health and well-being adversely (O'Quinn 2003). In a study conducted in Brazil, comparing cases to controls, people with epilepsy had worse sleep hygiene practices than those without epilepsy (Batista and Nunes 2007). Different studies conducted in Ethiopia have shown the prevalence of sleep disturbance among people with epilepsy; however, research on sleep hygiene practice has received less attention. In a study conducted in Ethiopia among people with HIV/AIDS 51.3% (Mengistu et al. 2021), and among medical students 48.1% (Molla and Wondie 2021) had poor sleep hygiene practices. However, it has not been studied among patients with epilepsy in Ethiopia. Poor sleep hygiene behaviors exacerbate seizure recurrence, and have negative effects on their physical, and mental health, knowing the frequency with which these sleep hygiene behaviors are engaged among people with epilepsy may help to guide future efforts at modifying such behaviors to control sleep-related problems (Hicks et al. 1999).

Epilepsy is the most common non-infectious neurological disease in developing countries (Osuntokun 1978). According to the World Health Organization (WHO), over 65 million individuals worldwide are affected by epilepsy, with nearly 80% of cases concentrated in low- and middle-income countries (WHO 2016). Surprisingly, around 70% of new-onset epilepsy occurs in adults, and patients with epilepsy face a higher risk of mortality compared to the general population (Ding et al. 2013).

Sleep disruption is a frequently reported issue among individuals with epilepsy, surpassing the prevalence in the general population (Pickett et al. 2016). Current research indicates that 40 to 74% of people with epilepsy experience significant sleep disturbances (Mengistu et al. 2021). Sleep disorders are roughly twice as common in those with epilepsy compared to those without, with approximately one-third of epilepsy patients reporting sleep disturbances (Khatami et al. 2006). This constitutes a global public health concern impacting millions of individuals (Wells and Vaughn 2012). Nocturnal seizures have been observed to disrupt sleep organization and architecture, with certain seizure types being more likely to occur during non-rapid eye movement (NREM) sleep and exacerbated by sleep deprivation. Although medications exist to manage sleep disturbances, they may come with several side effects, such as tolerance, increased pill burden, adverse reactions, drug dependency, and higher healthcare costs (Cooke et al. 2020). Therefore, non-pharmacological interventions, such as cognitive-behavioral therapy and sleep hygiene practices, are currently being utilized to manage poor sleep quality (Aritake-Okada et al. 2019). These interventions focus on behavioral changes with minimal or no complications to improve and promote sleep hygiene practices among individuals with epilepsy.

Sleep hygiene encompasses a set of behavioral and environmental recommendations that either facilitate or hinder sleep (Carney et al. 2017). While various non-pharmacological interventions, such as cognitive-behavioral therapy, have proven more effective than sleep hygiene in addressing insomnia, the feasibility, cost-effectiveness, absence of side effects, and potential for immediate response to sleep problems make sleep hygiene a more applicable treatment option for individuals with epilepsy in resource-limited areas with financial constraints and limited access to healthcare services, such as low-income countries. Poor sleep hygiene is considered a core factor contributing to chronic insomnia (Stepanski and Wyatt 2003). Moreover, it plays a role in the maintenance of other sleep disorders, including obstructive sleep apnea (Jung et al. 2019), shift work disorder (Booker et al. 2020), and restless leg syndrome (Sönmez et al. 2018). Conversely, implementing sleep hygiene practices may address the public health concern of sleep complaints in the general population (Irish et al. 2015). Sleep hygiene has been found to predict better mental health, lower depression, and higher well-being in healthy individuals (Peach et al. 2016).

However, the adoption of sleep hygiene practices partly depends on individuals' knowledge and perception of sleep physiology and its clinical significance. Sleep hygiene practices have a significant impact on daily functioning, including health, mood, regulation of behavior, academic performance, and overall quality of life (Mindell and Owens 2015). Poor sleep hygiene practices are expected to have particularly adverse effects on mood and quality of life in people with epilepsy (Lee et al. 2015b; Sandstrom et al. 2010). Among individuals with epilepsy, poor sleep hygiene practices can contribute to an increased frequency of seizures, impaired daytime functioning, elevated risk of accidents, decreased productivity, poor treatment outcomes, and an overall inability to function at their maximum potential (Piperidou et al. 2008; Cho et al. 2013). Its deprivation weakens physical function, impairs cognitive and emotional functioning (Falck et al. 2020), and can lead to mental health issues (Gupta et al. 2019; Chou et al. 2015). Consequently, maintaining sleep hygiene behaviors could

enhance sleep quality, mood, and quality of life in individuals with epilepsy.

Various factors influence poor sleep hygiene practices and potentially contribute to altered sleep behaviors, including the presence and frequency of seizures, the effects of anti-epileptic medications, coexisting primary sleep disorders, the presence of psychiatric comorbidities, and subjective sleep quality (Im et al. 2016; Wigg et al. 2014).

Despite the clinical significance and feasibility of sleep hygiene, it remains under-recognized and largely overlooked by professionals (Phillips et al. 2005). According to our research engine, there is no published research in Africa, including Ethiopia, regarding the sleep hygiene of people with epilepsy and its correlates. Therefore, this study aims to address this gap by assessing sleep hygiene awareness, practice, and its predictors in this region. The results will have important clinical and policy implications, providing policymakers, planners, and health professionals with valuable insights to design strategies for improving sleep hygiene practices among individuals with epilepsy. The findings of this study will also contribute to future research in this field. That is why we are interested in conducting this research.

Materials and methods

Study design, area and populations

A cross-sectional study was conducted from May 1 to June 2, 2023, at Mettu Karl Comprehensive Specialized Hospitals (MKCSH) and Bedele General Hospital in Ethiopia. Mettu town is located approximately 600 km southwest of the capital city, Addis Ababa. MKCSH is the sole referral hospital in the Ilu Ababore zone, serving two zones of the Oromia regional state, Gembella provincial state, and the Southern Nations & Nationalities and People national region.

The study included adults with epilepsy who had received follow-up services for at least six months at the Neurology department of MKCSH and Bedele General Hospital during the data collection period. Individuals under the age of 18, those with serious illnesses, and those unable to respond during the data collection time were excluded.

Sample size determination and procedures

Sample size determination

The sample size was determined using a single population proportion formula with a 95% confidence interval, 5% marginal error, an estimated proportion (P) of 50% since no previous studies were conducted on sleep hygiene among patients with epilepsy in Ethiopia, and a 10% non-response rate. The total sample size calculated was 424.

Sampling procedure

Participants were selected for interviews using the systematic random sampling technique. Before data collection, the total number of epilepsy patients visiting the hospitals was identified from patient records. The average flow of epilepsy patients during the data collection period was estimated to be 1,269 (878 from MKCSH and 391 from Bedele General Hospital). The sample size of 424 was proportionally allocated to each hospital. The sampling interval (k) was calculated as $1269/424 \approx 3$. Therefore, participants were selected at every 3rd interval until the required sample size was reached. The first individual was chosen using a lottery method (Fig. 1).

Data collection instruments

Data were collected using face-to-face interviewer-administered questionnaires that included the Sleep Hygiene Index (SHI) to assess sleep hygiene practice. SHI is a 13-item instrument derived from the diagnostic criteria for inadequate sleep hygiene in the International Classification of Sleep Disorders. The 13-item questionnaire is widely used in research and in clinical practice. The tool has adequate construct reliability and validity with Cronbach's alpha of 0.71 (Ozdemir et al. 2015; Mastin et al. 2006). Participants were requested to indicate how frequently they engage in specific behaviors,and rated each item on a five-point scale ranging from 0 (never), 1 (rarely), 2(sometimes),3 (always),and 4 (frequently). The items were summed to provide a global assessment of sleep hygiene practice. The overall score ranges from 0 to 52. In the current study, the Cronbach's alpha of SHI was 0.81. The total sum score was categorized as "good practice" or "poor practice" using the mean score of SHI as a cutoff point. Participants with above and equal to the mean score were considered to have poor sleep hygiene practices (Ozdemir et al. 2015).

Explanatory variables were measured using standardized, and validated tools, including the Pittsburgh Sleep Quality Index (PSQI) to measure sleep quality (Buysse et al. 1989). A global personal sleep quality score ranges between 0 and 21. It was validated in Ethiopia to measure sleep quality status in community settings with a sensitivity of 82% and specificity of 56.2% with Cronbach's alpha of 0.81 (Salahuddin et al. 2017). The Cronbach alpha of PSQI in the current study was 0.82. Using a global scale PSQI, consider having poor sleep quality if the score is > 5 (Buysse et al. 1989). The Kilifi Stigma Scale of Epilepsy to was used measure perceived stigma which was developed and validated in Kilifi, Kenya. It has high internal

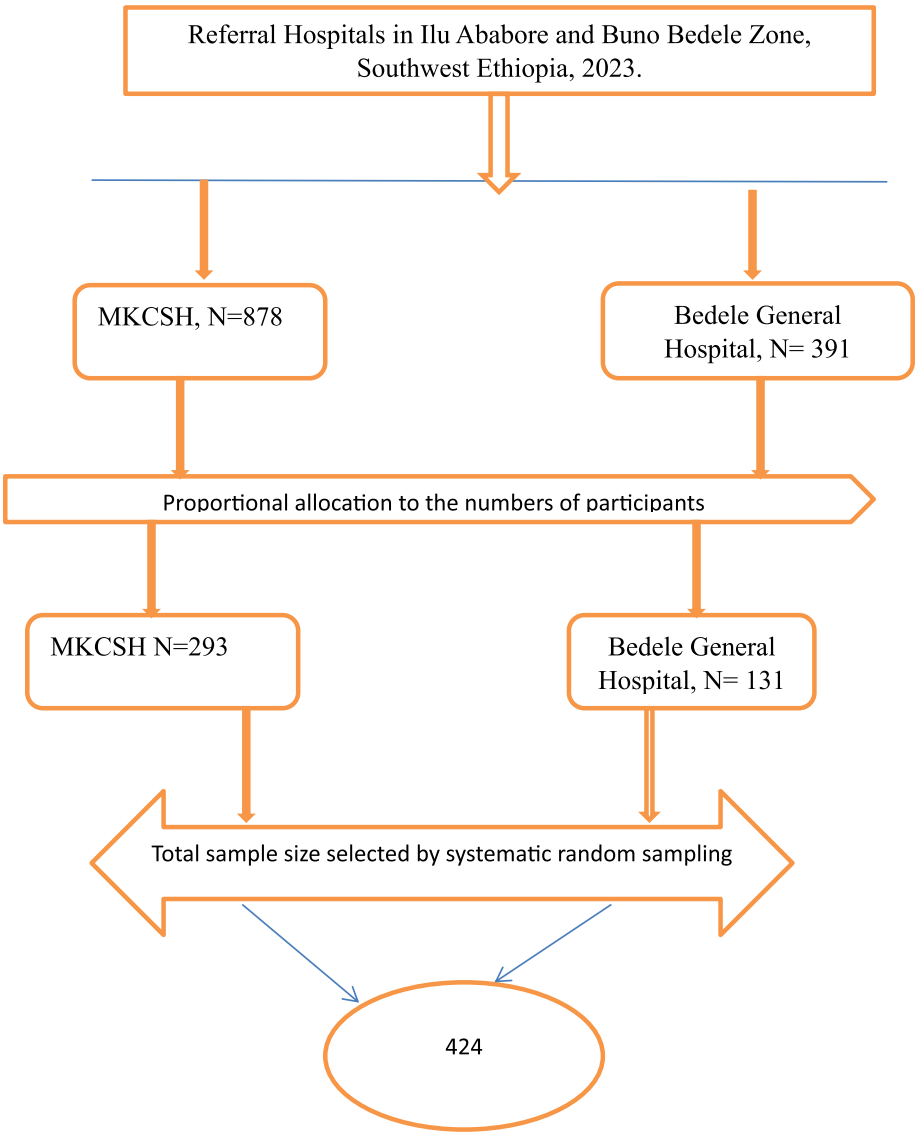

Fig. 1 Proportional allocation of sample size among adults with Epilepsy attending Follow up care at Mettu Karl Comprehensive Specialized Hospitals in Ilu Ababora Zone and General Hospital in Buno Bedele zone, Southwest Ethiopia ($n=424$)

consistency with a Cronbach's alpha of 0.91. The scale uses a three-point Likert scoring system, where responses are scored as "not at all" (0), "sometimes" (1), and "always" (2). A score above the median value indicates the presence of perceived or felt stigma (Mbuba et al. 2012). In this study, Cronbach's alpha was 0.84. The Hospital Anxiety and Depression Scale (HADS) to assess anxiety and depression.In this study, the internal consistency between items was Cronbach's alpha of 0.80 and 0.85 to measure anxiety and depression subscales, respectively. Participants who score ≥ 8 from HADS-A have anxiety, and those who score ≥ 8 from HADS-D have depression (Reda 2011). Medication Adherence Rating Scale (MARS) to evaluate medication adherence. In this study, Cronbach's alpha = 0.76. Patients who scored below seven were considered non-adherent to their anti-epileptic medications (Owie et al. 2018). A substance use questionnaire adapted from the ASSIST to assess substance use (Humeniuk et al. 2008). The Oslo 3 Social Support Scale used determine the level of social support. The scale divides the level of social support into three levels: poor social support (3–8), moderate social support (3–14), and strong social support (12–14) (Dalgard et al. 2006). Socio-demographic factors and epilepsy-related clinical characteristics were also recorded from the clients' medical charts confidentially.Clinically related factors include

frequency of seizure, age of onset of the illness, duration of treatment, duration of illness, treatment regimen, type of medication, seizure type, comorbid medical illness, and family history of mental illness.

Data collection procedure

The questionnaire was first prepared in English, translated into the local languages Amharic and Afaan Oromoo, and back-translated to English by language experts and mental health specialists to ensure its consistency, and understandability. The study used standardized and validated assessment tools. The data collectors and supervisors received training on the data collection tools, procedures, and ethical concerns. The questionnaire was pre-tested, before the actual study was conducted. The data collectors and supervisors prepared the entire procedure two days before the data collection. Close supervision was carried out during the data collection period, and the investigators checked the consistency of the completed questionnaires at the end of each day. The data was collected through face-to-face interviews using pre-tested structured and standardized questionnaires.

Data processing and analysis

The data was entered using Epi-Data version 3.1 and analyzed using SPSS version 25.0 software. Descriptive statistics were used to summarize the data distribution, and frequency and percentage were presented. The results were presented in tables. Bivariate and multivariable logistic regression models were applied. Variables with a *p*-value of less than 0.2 in the bivariate analysis were included in the multivariable regression analysis to control for possible confounding effects. The model was assessed for goodness of fit using the Hosmer–Lemeshow test. In the multivariable logistic regression analysis, statistically significant associated factors were determined using Adjusted Odds Ratios (AOR) with 95% confidence intervals (CI) and a *p*-value of less than 0.05.

Results

Socio-demographic characteristics of the participants

A total of 420 participants were involve in this study, resulting an overall response rate of 99.1%. The mean age of the respondents was 29.1 years (standard deviation ± 7.35), ranging from 18 to 61 years. Among the study participants, 219 (52.1%) were females, 247 (54.3%) were married. The majority of the participants (62.6%) living in rural areas, and 191 (45.5%) were unable to read and write (Table 1).

Table 1 Socio-demographic characteristics of participants with epilepsy attending follow up care at Mettu Karl comprehensive specialized hospitals in Illu Ababora Zone and general hospital in Buno Bedele zone, Southwest Ethiopia,2023 ($n = 420$)

	Categories	Frequency	Percent (%)
Sex	Male	201	47.9
	Female	219	52.1
Age (in years)	18–24	99	23.6
	25–34	179	42.6
	35–44	107	25.5
	> = 45	35	8.3
Marital status	Single	132	31.4
	Married	247	54.3
	Others*	41	14.3
Religion	Orthodox	152	36.2
	Muslim	131	31.2
	Protestant	101	24.0
	Others**	36	8.6
Educational status	Unable to read and write	191	45.5
	Primary school	87	20.7
	Secondary school	73	17.4
	College and above	69	16.4
Occupational status	Farmer	160	38.1
	Government employee	56	13.3
	Self-employee	34	8.1
	Housewife	112	26.7
	Jobless	58	13.8
Residence	Rural	263	62.6
	Urban	157	37.4

Other*: Divorced, widowed, and separated

Other**: Catholic, Waqefeta, and Adventist

Frequency of poor sleep hygiene practices among respondents

Overall, the frequency of poor sleep hygiene practice among people with epilepsy was 59.5% [95% CI (54.3, 63.8)]. The majority of participants (89.6%) reported not hearing any previous information regarding sleep hygiene practices, while 10.4% obtained information from media and other sources. None of the participants had attended any training related to sleep hygiene practice. Among the respondents, 291 (69.2%) always went to bed feeling stressed, angry, upset, or nervous; 347 (82.6%) use alcohol, tobacco, or caffeine before their bedtime; 223 (53.1%) reported thinking, planning, and worrying in bed; and 387 (92.1%) of participants always go to bed at different time from day to day.

Clinical characteristics of the participants

Among study participants, 217 (51.7%) used polytherapy anti-epileptic medication, 240 (57.1%) used

Phenobarbital. Regarding seizure frequency 166 (39.5%) of patients with epilepsy had one up to two seizure frequencies per month. Among respondents, 181 (43.1%) of patients with epilepsy had poor medication adherence (Table 2).

Description of behavioral and psychosocial characteristics of the study participants

The psychological characteristics indicated that out of the total study participants, 223 (53.1%), and 162 (38.1%), were found to have the symptoms of anxiety, and depression respectively. Regarding substance use, more than one-third (37.4%) of patients with epilepsy were current khat users. Among the study participants, 175(41.7%) had received poor social support, 261 (62.1%) had poor sleep quality, and 156 (37.1%) reported perceived stigma (Table 3).

Predictors of poor sleep hygiene practices

In the bivariate analysis, variables such as sex, residence, seizure frequency, treatment regimen, medication adherence, depression, anxiety, perceived stigma, poor sleep quality, current use of khat, and current use of alcohol showed a p-value of < 0.2 and were included as candidates for multivariable analysis. In the multivariable binary logistic regression, medication adherence, depression, anxiety, poor sleep quality, and current use of alcohol

Table 2 Clinical characteristics among adults with epilepsy attending follow up care at Mettu Karl comprehensive specialized hospitals in Illu Ababora zone and general hospital in Buno Bedele zone, Southwest Ethiopia, 2023 (n=420)

Variables	Categories		Frequency	Percent (%)
Seizure frequency/month	0		105	25.0
	1-2		166	39.5
	≥3		149	35.5
Duration of treatment in years	< 5		175	41.7
	6–10		144	34.3
	≥ 11		101	24.0
Duration of the age of onset in years	≤ 10		67	15.9
	11-20		214	50.9
	≥21		139	33.2
Duration of illness in years	1-4		122	29.1
	5-10		200	47.6
	>10		98	23.3
Treatment regimen	One medication		203	48.3
	More than one medication		217	51.7
Type of medication	Carbamazepine	Yes	143	34.1
		No	277	65.9
	Phenobarbital	Yes	240	57.1
		No	180	42.9
	Phenytoin	Yes	173	41.2
		No	247	58.8
	Sodium valproate	Yes	131	31.2
		No	289	68.8
	Other medication	Yes	27	6.4
		No	393	93.6
Seizure type	Focal		77	18.3
	Generalized		343	81.7
Comorbid medical illness	Yes		72	17.1
	No		348	82.9
Family history of mental illness	Yes		64	15.2
	No		356	84.8
Drug adherence	Good		239	56.9
	Poor		181	43.1

Table 3 Behavioral and Psychosocial characteristics of adults with Epilepsy attending Follow up care at Mettu Karl Comprehensive Specialized Hospitals in Illu Ababora Zone and General Hospital in Buno Bedele zone, Southwest Ethiopia,2023 ($n=424$)

Variables	Categories	Frequency	Percent (%)
Ever use of khat	Yes	191	45.5
	No	229	54.5
Current use of khat	Yes	157	37.4
	No	263	62.6
Ever use of alcohol	Yes	162	38.6
	No	258	61.4
Current use of alcohol	Yes	148	35.2
	No	272	64.8
Ever use of cigarette	Yes	128	30.5
	No	292	69.5
Current use of cigarette	Yes	114	27.1
	No	306	72.9
Ever use of shisha	Yes	14	3.3
	No	406	96.7
Current use of shisha	Yes	10	2.4
	No	410	97.6
Social support	Strong	109	25.9
	Moderate	136	32.4
	Poor	175	41.7
Anxiety	Yes	223	53.1
	No	197	46.9
Depression	Yes	162	38.6
	No	258	61.4
Perceived stigma	Yes	156	37.1
	No	264	62.9
Sleep Quality	Good	159	37.9
	Poor	261	62.1

were significantly associated with poor sleep hygiene practices among people with epilepsy in Ethiopia.

The odds of exhibiting poor sleep hygiene practices were 1.86 times higher among patients who were non-adherent to their AED medications compared to those who adhered to it (AOR = 1.86, 95% CI: 1.13, 3.23). Participants with depression were twice as likely to have poor sleep hygiene practices compared to those without depression (AOR = 2.10, 95% CI: 1.42, 4.21). Individuals with anxiety symptoms had 2.71 times higher odds of poor sleep hygiene practices (AOR = 2.71, 95% CI: 1.67, 4.82). Patients with epilepsy who experienced poor sleep quality had 5.70 times higher odds of poor sleep hygiene practices compared to those with good sleep quality (AOR = 5.70, 95% CI: 3.12–10.01). Furthermore, the odds of having poor sleep hygiene practices were approximately 1.74 times higher among participants who currently use alcohol compared to the reference group (AOR = 1.74, 95% CI: 1.27, 3.13) (Table 4).

Discussion

Sleep hygiene practices are recommended as part of the treatment strategies for individuals with sleep disturbances, including people with epilepsy. However, this study found that people with epilepsy in Ethiopia had limited knowledge,information, and understanding of sleep hygiene practices. The lack of information and understanding may hinder the implementation of sleep hygiene practices (Lee et al. 2015a), which are crucial for promoting better mental health. So, implementing sleep hygiene practices addresses the public health concern of sleep complaints.

This study is the first of its kind at the national level in Ethiopia, providing valuable insights into the understanding and implementation of sleep hygiene practices among people with epilepsy. The findings emphasize the need for strategies to promote sleep hygiene, particularly among clinical populations such as people with epilepsy.

The study revealed that a significant proportion (89.6%) of individuals with epilepsy had never been exposed to information on sleep hygiene, and none of the participants had received any training on the subject. Regarding the prevalence of sleep hygiene practices, the majority (92.1%) reported inconsistent bedtimes, 82.6% consumed alcohol, tobacco, or caffeine before or after bedtime, and 53.1% engaged in thinking, planning, and worrying while in bed. Females exhibited poorer sleep hygiene practices compared to males, and individuals with anxiety symptoms were more likely to have poor sleep hygiene practices compared to those without anxiety.

In this study, the frequency of poor sleep hygiene practice among people with epilepsy was 59.5% (95% CI:54.3,63.8). This is consistent with previous research in this area (Manni et al. 2000). Integrating sleep hygiene promotion into epilepsy care services, particularly in neurology clinics, can help address this issue (Huang et al. 2017). Psychosocial interventions that focus on adapting and implementing sleep hygiene practices are also recommended as cost-effective ways to assist individuals living with epilepsy (Wang et al. 2005). However, the prevalence of poor sleep hygiene practice in this study was higher than in previous studies done in Ethiopia among medical students, and among people with HIV/AIDS, which reported a prevalence of 48.1% (Mengistu et al. 2021), and 51.3% (Molla and Wondie 2021) respectively. The possible explanation for this discrepancy might be due to sampling population differences, level of mental health awareness, and study settings. For example, the above study was conducted among medical students who had access to information about the treatment

Table 4 Bi-variables and multi-variables regression analysis between outcome variable and explanatory variables among people with epilepsy attending follow-up care at referral hospitals in Illu Ababore and Buno Bedele zone, southwest Ethiopia, 2023 ($n=420$)

Variables	Variables	Sleep hygiene practice		COR(95%CI)	AOR (95% CI)	*P*-value
		Poor	Good			
Sex	Female	139	80	1.41(0.89–2.00)	0.96(0.53- 1.85)	0.14
	Male	111	90	1	1	
Seizure frequency/month	≥3	97	52	1.15(0.68–1.94)	0.81(0.48- 1.72)	0.13
	1–2	88	78	0.69(0.38–1.57)	0.68(0.12–1.97)	0.34
	0	65	40	1	1	
Treatment regimen	More than one medication	137	80	1.36(0.84–1.98)	1.23(0.58–1.74)	0.36
	One medication	113	90	1	1	
Drug adherence	Poor	120	61	1.65(1.20–2.46)	1.86(1.13–3.23)	0.021*
	Good	130	109	1	1	
Depression	Yes	115	47	2.23(1.48–3.21)	2.10(1.42–4.21)	0.002**
	No	135	123	1	1	
Anxiety	Yes	161	62	3.15(1.89–5.10)	2.71(1.67–4.82)	0.001**
	No	89	108			
Perceived stigma	Yes	101	55	1.42(0.89–2.01)	1.31(0.74–1.87)	0.624
	No	149	115	1	1	
Sleep Quality	Poor	197	64	6.16(3.86–11.0)	5.70(3.12–10.01)	0.0001**
	Good	53	106	1	1	
Current use of khat	Yes	100	57	1.32(0.84–2.17)	0.81(0.79–1.44)	0.47
	No	150	113	1	1	
Current use of alcohol	Yes	103	45	1.94(1.25–3.29)	1.74(1.27–3.13)	0.023*
	No	147	125	1	1	

Hosmer–Lemeshow test = 0.72

Note: *p*-value = **<0.01; *<0.05

of sleep problems including sleep hygiene practice from books, medias,and learning in the class as compared to the current study. Moreover, the level of sleep hygiene knowledge, access to educational opportunities, and the ability to implement sleep hygiene practices might have affected the reported prevalence (Junqueira et al. 2008; Brown et al. 2006).

Regarding, factors affecting poor sleep hygiene practice, participants with poor medication adherence to their AEDs were 1.86 more likely to have poor sleep hygiene practice as compared to their counterparts. This result is similar to a finding of different studies from India,and United States (Turaga et al. 2016; Xu et al. 2006). The possible justification might be that patients with epilepsy with poor medication adherence to their AEDs could be attributed to increased seizure frequency, hospital admissions, healthcare costs, and worse clinical outcomes associated with poor medication adherence to patients having poor sleep hygiene practice (Chen et al. 2011). This could also be due to, poor adherence to AEDs which may lead to reduced seizure control, decreased work productivity, job loss related to seizures, stress, and poor sleep quality.

In the current study, we found that participants who had depressive symptoms were two times more likely to have poor sleep hygiene practices as compared to undpressed participants. This result was in line with studies done in China,and Germen (Yang et al. 2020; Leistner et al. 2015). The possible reason might be due to diminished motivation and lack of energy in individuals with depression, which may limit their ability to engage in sleep hygiene practices (Voinescu and Szentagotai-Tatar 2015).The other possible reasons this association should be that serotonergic neurons play a crucial role in regulating sleep onset and maintenance, and its dysfunction can contribute to poor sleep hygiene practices among individuals with depressive symptoms (Haut et al. 2009; Stauder et al. 2020). Moreover, people with depressive symptoms commonly used addictive substances to escape from their stressful situation and such substances may cause individuals to become careless and forgetful in practicing sleep hygiene activities (Pope et al. 2019). Thus, addressing mental health issues among patients with epilepsy is crucial.

Furthermore, the study showed that individuals with epilepsy who had anxiety symptoms were 2.71 times

more likely to have poor sleep hygiene practices than participants who had no anxiety symptoms. This finding is supported by other studies done in Korea,and Brazil (Wigg et al. 2014; Im et al. 2016). One possible explanation is that anxiety can make it more difficult for individuals to fall asleep. Additionally, sleep deprivation can exacerbate anxiety, creating a negative cycle involving insomnia and anxiety disorders (Neves et al. 2016). Another possible reason is that individuals with epilepsy may experience higher levels of anxiety, which can disrupt their ability to maintain consistent sleep patterns. The stress associated with the illness itself may also contribute to poor sleep hygiene practices among individuals with epilepsy.

Moreover, participants who reported poor sleep quality were 5.7 times more likely to have poor sleep hygiene practices compared to those with good sleep quality. This finding was agreed with previous study in Hong Kong,China (Suen et al. 2010). The probable reason for this association might be poor sleep hygiene practices, and behaviours dependent on the patients, overall lack of consistency in both quantity and quality of sleep including difficulties falling asleep, frequent sleep disturbances, and daytime sleepiness which can all contribute to poor sleep quality and, in turn, affect sleep hygiene practices. Additionally, behaviors such as eating, drinking, watching TV, using electronic devices, reading, or engaging in physical activity before bedtime can also impact sleep hygiene (Nobili et al. 2021; Voinescu and Szentagotai-Tatar 2015).

Finally, the odds of having poor sleep hygiene practice among respondents with current alcohol drinkers were 1.74 times more likely to experience poor sleep hygiene practices. This finding is consistent with a previous study done in USA (Garcia and Salloum 2015). The association between alcohol consumption and poor sleep hygiene practices may be explained by the direct effects of alcohol on sleep structure and quality. Alcohol can inhibit rapid eye movement sleep and increase slow-wave sleep in the first half of the sleep period. In addition, ethanol acts as a central nervous system depressant, which can negatively affect sleep quality (Erdozain et al. 2014). Another possible explanation is that individuals with epilepsy who are experiencing high levels of stress may turn to alcohol as a coping mechanism, which can negatively impact their sleep quality. Moreover, drinking alcohol as a stress reliever may disrupt sleep hygiene practices (Kataria and Vaughn 2016). The possible justification is that alcohol is a diuretic, which has been linked to a person's need to urinate more frequently to empty their bladder, resulting in poor sleep hygiene practice due to irregular sleep–wake schedules, unhealthy sleep habits, or a greater need for sleep in the evening (Voinescu et al. 2012; Voinescu and Szentagotai-Tatar 2015).

Limitation of the study

While this study provides valuable insights into the sleep hygiene practices among individuals with epilepsy in Ethiopia, there are a few limitations to consider. Firstly, the participants in this study were drawn from a specific population of people with epilepsy, which may not be fully representative of the general population in Ethiopia. The findings may not be applicable to individuals with epilepsy in other regions or countries, limiting the generalizability of the results.

Secondly, the study design was cross-sectional, which means that it captured data at a single point in time. As a result, it is challenging to establish cause-effect relationships between the variables studied. Longitudinal studies that follow participants over time would provide a more comprehensive understanding of how sleep hygiene practices and various factors interact and influence each other.

Conclusions

This study showed that more than half of patients living with epilepsy had poor sleep hygiene practice. Drug adherence, depression, anxiety, poor sleep quality, and current use of alcohol were statistically significant predictors of poor practice of sleep hygiene. To improve sleep hygiene practices, it is crucial for healthcare professionals to develop targeted intervention programs that address these risk factors. Integrating sleep hygiene education and interventions as part of comprehensive epilepsy care can significantly enhance the overall well-being of individuals with epilepsy. Additionally, the findings emphasize the need for ongoing training and health education for individuals with epilepsy, with a focus on improving their understanding and practice of sleep hygiene. By empowering patients with knowledge and skills to prioritize their sleep health, we can foster positive changes in their sleep hygiene practices.

Moving forward, further research is warranted to explore the risk factors associated with poor sleep hygiene in individuals with epilepsy, utilizing various study designs. By employing diverse research methodologies, we can gain a more nuanced understanding of the complex interplay between epilepsy, sleep hygiene, and associated factors, ultimately leading to more effective interventions and improved outcomes for individuals with epilepsy.

Abbreviations

AED	Anti-epileptic drug
AOR	Adjusted Odds Ratio
HADS	Hospital Anxiety and Depression Scale

MARS Medication Adherence Rating Scale
MKCSH Mettu Karl Comprehensive Specialized Hospital
PSQI Pittsburgh Sleep Quality Index
SHI Sleep Hygiene Index

Acknowledgements
We would like to express our sincere gratitude to all the participants who generously gave their time and cooperated with us during this study. We also extend our appreciation to the dedicated data collectors and supervisors who played a vital role in ensuring the quality of the data.

Authors' contributions
TS conceived the study and contributed to the design, analysis, interpretation of data, and manuscript writing. MM, TT, GN, TW, ES, and GTZ significantly contributed to the conception, analysis, data interpretation, manuscript drafting, and critical revision of important intellectual content. All authors have read and approved the final manuscript.

Funding
This work did not receive any specific funding.

Availability of data and materials
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Ethical approval for this study was obtained from the Ethical Review Committee (ERC) of the Mettu University Department of Psychiatry. Informed written consent was obtained from each participant after providing a clear explanation of the study's purpose and objectives. Participants were assured that their participation was voluntary and that they had the right to withdraw at any time without any negative consequences. To ensure confidentiality, participants' identities were kept anonymous, and personal information was treated with strict confidentiality throughout the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]Department of Psychiatry, College of Health Science, Mettu University, Mettu, Ethiopia. [2]Department of Psychiatry, College of Medicine and Health Science, University of Gondar, Gondar, Ethiopia. [3]Department of Psychiatry College of Medicine and Health Science, Debre Markos University, Debre Markos, Ethiopia. [4]Department of Psychiatry, College of Medicine and Health Science, Dilla University, Dilla, Ethiopia. [5]Department of Psychology, Institute of Teachers Education and Behavioral Sciences, Wollo University, Dessie, Ethiopia.

Received: 6 April 2024 Accepted: 30 July 2024
Published online: 11 November 2024

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