Epilepsy & Behavior 52 (2015) 225–229

Contents lists available at ScienceDirect

Epilepsy & Behavior

journal homepage: www.elsevier.com/locate/yebeh

Sleep hygiene and its association with mood and quality of life in people with epilepsy

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ARTICLE INFO

Article history:
Received 3 July 2015
Revised 18 August 2015
Accepted 12 September 2015
Available online 6 November 2015

Keywords:
Epilepsy
Sleep hygiene
Sleep quality
Daytime sleepiness
Depression
Anxiety
Quality of life
Sleep disturbance

ABSTRACT

Objectives: We determined whether sleep hygiene is directly related to mood and quality of life (QoL) in people with epilepsy and, if not, documented the indirect effects of sleep hygiene through sleep quality.
Methods: Data were collected from 150 adults with epilepsy. The Sleep Hygiene Index (SHI), Quality of Life in Epilepsy—10 (QOLIE-10), Hospital Anxiety and Depression Scale (HADS), Sleep Problems Index—2 (SPI-2) of the Medical Outcomes Study—Sleep Scale, and Epworth Sleepiness Scale (ESS) were used. To determine the direct and indirect associations between SHI, mood, and QoL, multiple linear regression analyses and the Sobel test were performed.
Results: Inadequate sleep hygiene behaviors were answered affirmatively by ≥15% of the participants represented by 6 out of 13 items of the SHI. A younger age was independently related to higher SHI scores ($p = 0.013$). The higher SHI scores were directly related to lower QoL independent of sleep quality, anxiety, and depressive symptoms ($p < 0.05$) but not independently related to anxiety and depressive symptoms. The Sobel test confirmed that the SHI scores were associated with anxiety and depressive symptoms through sleep quality ($p < 0.001$).
Conclusions: Inadequate sleep hygiene is independently related to low QoL but indirectly related to anxiety and depressive symptoms through sleep quality. Patients of a younger age are at risk of poorer sleep hygiene.

1. Introduction

Epilepsy is frequently accompanied by sleep disturbance, which is reported to occur in one-third of people with epilepsy [1] and is greater than twice as prevalent in people with partial epilepsy compared with controls without epilepsy [2]. The etiology of sleep disruption in people with epilepsy is multifactorial and includes factors such as inadequate sleep hygiene, coexisting sleep disorders, epilepsy per se, seizure frequency, and the effect of antiepileptic medications [3]. Poor sleep is expected to have particularly negative effects on mood and quality of life (QoL) in people with epilepsy because epilepsy is in itself frequently associated with depression and low QoL [4,5]. Piperidou et al. [6,7] demonstrated that patients with epilepsy with a sleep disturbance, mainly those with insomnia, had a lower QoL than those without sleep complaints.

Sleep hygiene may be described as practicing behaviors that facilitate sleep (e.g., maintaining a regular sleep–wake schedule and regular exercise) and avoiding behaviors that interfere with sleep (e.g., daytime napping, smoking, and evening caffeine and alcohol consumption) [8]. The associations of each of these behaviors with sleep are well-documented [9–13]. Sleep hygiene is considered one of the conservative treatments, especially for patients with chronic insomnia. Thus, maintaining sleep hygiene behaviors could improve sleep quality, which in turn may improve mood and QoL in individuals with epilepsy. However, there have been few studies focused on the association of sleep hygiene with mood and QoL in people with epilepsy [14]. The aims of our current study were twofold: (1) to determine whether sleep hygiene is directly related to mood and QoL, independent of sleep quality or other confounding factors in adults with epilepsy and (2) if not, to document the indirect effects of sleep hygiene through sleep quality in adults with epilepsy.

2. Methods

2.1. Subjects

This cross-sectional, multicenter study was performed on adults with epilepsy who attended the neurological outpatient clinics of five

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http://dx.doi.org/10.1016/j.yebeh.2015.09.011
1525-5050/

university hospitals in Korea. To be eligible, individuals had to meet the following inclusion criteria: >18 years of age, being diagnosed with any type of epilepsy, and taking one or more antiepileptic drugs (AEDs) for at least 1 year at the time of recruitment. Subjects were excluded if they experienced a seizure in the 48 h prior to filling out the questionnaires, were shift workers or worked later than 8 p.m., had a neurological deficit that affected daily living activities, had received treatment for active psychiatric or medical disorders, or were unable to read or understand the questionnaires.

A total of 150 adults with epilepsy participated in this study. They were asked to fill out questionnaires on the day they visited their neurologists at the outpatient clinic. Demographic and clinical data were collected through interviews and by reviewing each patient's medical files. The participant characteristics are listed in Table 1. The mean age was 37.4 years (SD: 10.7). Hospital Anxiety and Depression Scale—Depression (HADS-D) and HADS—Anxiety (HADS-A) scores were ≥8 in 61 (42.7%) and 49 (34.0%) subjects, respectively. A score of ≥8 on the HADS-D or HADS-A is a recommended cutoff point for clinical diagnosis of possible anxiety or depression [15]. The Epworth Sleepiness Scale (ESS) score was ≥10 in 106 (40.8%) cases. A score of 10 or more on the ESS reflects above normal daytime sleepiness [16]. The mean Sleep Hygiene Index (SHI) score was 26.5 (SD: 7.7). Written informed consent was obtained from all study participants. The study was reviewed and approved by the Institutional Review Board of the Asan Medical Center.

2.2. Measures

The SHI is a 13-item self-administered index intended to assess the presence of behaviors thought to comprise sleep hygiene [17]. Items constructing the SHI were derived from the diagnostic criteria for inadequate sleep hygiene in the International Classification of Sleep Disorders [18]. Participants were asked to indicate how frequently they engage in specific behaviors (always = 5, frequently = 4, sometimes = 3, rarely = 2, or never = 1). Item scores were summed, providing a global assessment of sleep hygiene. A total possible score ranges from 13 to 65. Higher scores are indicative of poorer sleep hygiene status. Poor sleep hygiene behavior was defined by participants' responses of 'always' or 'frequently' to each item. Translation of SHI into Korean was done by the corresponding author (Lee SA).

Quality of life was assessed using the Quality of Life in Epilepsy—10 (QOLIE-10), which consists of 10 items and comprises seven components (seizure worry, overall QoL, emotional well-being, energy/fatigue, cognitive functioning, medication effects, and social function) [19]. Scoring is 0–100 points with higher scores indicating better QoL. The Korean version of QOLIE-10 was validated [20] and used in this study.

Anxiety and depressive symptoms were assessed using the HADS, which consists of 14 items, 7 related to anxiety (HADS-A subscale) and 7 related to depression (HADS-D subscale) [15]. Each item on the questionnaire is scored from 0 to 3, and a total possible score ranges from 0 to 21 for either anxiety or depression. Higher scores represent a higher level of symptoms of depression and anxiety. The Korean version of the HADS was validated [21] and used in this study.

Daytime sleepiness was assessed using the ESS, which consists of eight items each rated on a four-point scale [16]. The total possible score ranges from 0 to 24. Higher scores indicate greater sleepiness during daily activities. The Korean version of the ESS was validated [22] and used in this study.

Sleep quality was measured using the Medical Outcomes Study (MOS)—Sleep Scale [23], which is a 12-item self-administered, nondisease specific scale. The MOS—Sleep Scale consists of 6 domains (sleep disturbance, sleep adequacy, sleep quantity, daytime somnolence, snoring, and shortness of breath). The Sleep Problems Index—2 (SPI-2) is calculated using 9 items from 4 domains (sleep disturbance, sleep adequacy, daytime somnolence, and shortness of breath). Higher scores of SPI-2 indicate a more severe sleep problem. The Korean version of the MOS—Sleep Scale was validated [24] and used in this study.

Table 1
Patient characteristics (n = 150).

Male/female, n	70/80
Age, years, mean (SD)	37.4 (10.7)
Seizure onset, years, mean (SD)	22.1 (13.3)
Duration, years, mean (SD)	15.5 (8.8)
Epilepsy syndrome, n (%)	
Idiopathic generalized	27 (18.0)
Symptomatic/cryptogenic partial	104 (69.3)
Undetermined	19 (12.7)
Predominant seizure type, n (%)	
Simple partial	12 (8.5)
Complex partial	48 (48.2)
Generalized tonic–clonic	61 (43.3)
Seizure frequency in the last year, n (%)	
Seizure-free	60 (40.0)
<1/month	66 (44.0)
≥1/month	24 (16.0)
Monotherapy, n (%)	73 (48.7)
Questionnaire measures, mean (SD)	
HADS-D subscale	6.8 (3.5)
HADS-A subscale	6.4 (4.1)
Sleep Hygiene Index	26.5 (7.7)
Epworth Sleepiness Scale	6.8 (4.6)
Sleep Problem Index—2	28.7 (17.7)
Quality of Life in Epilepsy—10	73.3 (16.5)
Antiepileptic drugs[a]	
Valproic acid	56 (37.3)
Lamotrigine	45 (30.0)
Carbamazepine	44 (29.3)
Oxcarbazepine	39 (26.0)
Topiramate	24 (16.0)
Levetiracetam	20 (13.3)

HADS-D: Hospital Anxiety Depression Scale—Depression subscale, HADS-A: Hospital Anxiety Depression Scale—Anxiety subscale.
[a] Antiepileptic drugs prescribed in more than 10% of people with epilepsy.

2.3. Statistical analysis

Data were expressed as the mean and standard deviation. Correlations between numeric variables were conducted with the Pearson test, and mean values were compared using a Student's t-test or analysis of variance (ANOVA). To determine whether SHI is associated with HADS-D, HADS-A, or QOLIE-10 scores independent of sleep quality or the other confounding variables, we used multiple linear regression analysis. The confounding variables that showed p-values < 0.05 in the univariate analysis were included in the linear regression analysis. The confounding variables included in the analysis were age, sex, ESS, SPI-2, and epilepsy-related factors (age at seizure onset, epilepsy duration, type of epilepsy, dominant seizure type, frequency of both generalized and focal seizures, recurrence of generalized tonic–clonic seizure in the prior two years, seizure freedom during the last year, and AED treatments). Additionally, HADS-D and HADS-A were also included as confounding variables for the linear regression model for QOLIE-10. The significance level was set at $p < 0.05$. Data were analyzed using SPSS version 21.0 (IBM Corp., Armonk, NY).

A mediational model that proposes that the predictor variable (SHI) is related to outcome variables (HADS-D, HADS-A, or QOLIE-10) through the mediator variable (SPI-2) was tested. Outcome variables for a mediational model were chosen if they were not directly related to the predictor variable. Evidence for mediation is achieved if the relation between the predictor and outcome variables is reduced when the effects of the mediator are controlled. Before testing the mediational model, it was necessary to prove that the predictor variable, the mediator variable, and the outcome variables were interrelated [25]. The mediation effect was evaluated using the Sobel test conducted with R (version 3.2.1) package 'bda'.