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Evaluation of Sleep Quality in Patients with Migraine Attacks Presenting to the Emergency Department

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Abstract

Objective: To investigate the sleep quality of adult patients presenting to the emergency department (ED) with migraine attacks and explore the correlations with age, gender, and education period. The aim of this study was to compare the sleepiness scores and sleep quality of migraine patients presenting to the ED with severe migraine attacks with those of healthy controls.

Materials and Methods: This cross-sectional prospective study, adult migraine patients seeking care at the ED of a tertiary hospital over a 1-month period. Fifty-seven migraine patients and 25 age- and sex-matched healthy controls were enrolled in the study. A single medical professional utilized the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS) to assess each patient's headache-related disability.

Results: Patients with migraine attacks had significantly higher PSQI scores than the healthy control group (6.75±4.57 vs. 4.08±2.12; p=0.020). No substantial differences were observed in the PSQI between patient groups using the ESS. In patients with migraine attacks, ESS was significantly positive and strongly correlated with education level (rho=0.294, p=0.007) but not age.

Conclusion: This study highlighted a significant independent association between poor sleep quality and an increased risk of migraine attacks. Strengthening the assessment of sleep quality using the PSQI is valuable for the early prevention and treatment of migraine patients.

Keywords: Migraine, sleep quality, Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale

Introduction

Headache is a prevalent medical concern affecting a substantial proportion of the global adult population, with estimates indicating its prevalence in 50%-75% of adults, as reported by the World Health Organization [1]. Among primary headache disorders, migraine stands as a notably impactful condition characterized by heightened morbidity and disability. The current global prevalence of migraine ranges from 10% to 18% [2,3]. Sleep, an essential aspect of daily life, is a pivotal clinical consideration, with sleep disorders posing significant challenges in healthcare. The intricate relationship between headache, especially migraine, and sleep is well established. Inadequate sleep and various sleep disorders have been identified as factors that elevate the risk of developing headaches while simultaneously reducing pain thresholds [4-7]. The relationship between headache disorders and sleep disturbances is complicated and multidimensional, often exhibiting bidirectional influences. Establishing causal relationships in patients concurrently experiencing sleep and headache disorders poses significant challenges. The coexistence of these syndromes often leads to chronicity, worsening the burden on individuals by diminishing their quality of life, increasing the frequency of complications, and reducing the effectiveness of treatment [8]. Migraine and sleep disorders are prevalent in a substantial proportion of the population, often leading to prolonged disability in affected individuals [9]. The Epworth Sleepiness Scale (ESS), an eight-item scale, is a valuable tool for assessing excessive daytime sleepiness [10]. Another commonly employed measure, the Pittsburgh Sleep Quality Index (PSQI),

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is a self-reported questionnaire designed to evaluate sleep quality over the preceding month. Numerous studies have utilized the PSQI to identify poor sleep quality in migraine patients [11]. Given the evident connection between sleep quality and migraine attack, PSQI and ESS scores have the potential to serve as predictive indicators of migraine attacks. Despite this, few studies have systematically explored the predictive value of PSQI scores in the context of migraine.

The current study aimed to provide an objective evaluation of sleep quality among patients presenting to the ED with migraine attacks. Additionally, previous studies have evaluated the predictive efficacy of PSQI and ESS scores in the context of migraine, offering novel insights for the early prevention and screening of migraine attacks.

Materials and Methods

Ethical clearance for the present study was granted by the Ethics Committee of the University of Health Sciences Türkiye, İstanbul Haseki Training and Research Hospital (approval number: 155-2023, date: 16.10.2023). The research adhered to the ethical principles outlined in the 1989 Declaration of Helsinki.

Patient Population

This prospective cross-sectional study enrolled a total of 57 consecutive adult patients who sought medical attention at the ED. Additionally, a healthy control group consisting of 25 age- and sex-matched healthy volunteers was included. After the measurement of vital functions, patients were observed in an isolated area within the ED, and either they or their authorized representatives provided written informed consent. The healthy participants were briefed on the study protocol and provided signed informed consent prior to participation. Migraine diagnoses were based on the third edition criteria of the International Classification of Headache Disorder [12].

Data Collection

Patient data, including age, sex, symptoms, and years of education, were systematically recorded. Subsequently, a separate cross-sectional analysis was conducted on 57 migraine patients to explore the associations between sleep quality and education years. All participants underwent a professional diagnostic assessment using standardized questionnaires administered by an emergency medicine specialist. Voluntarily and with signed informed consent, participants actively engaged in the study.

Pittsburgh Sleep Quality Index

The sleep quality of the participants was evaluated using the PSQI, a widely utilized self-rated questionnaire consisting of 19 items across seven components. These elements comprise subjective assessment of sleep quality, time to fall asleep (sleep latency), length of sleep, regularity in achieving restful sleep, disruptions during sleep, use of sleep medications, and daytime impairment. A PSQI score exceeding 5 indicated poor sleep quality, with a diagnostic sensitivity and specificity of 98.7 and 84.4, respectively [13].

Epworth Sleepiness Scale

The excessive daytime sleepiness was assessed using the ESS, an eight-item self-reported instrument widely adapted to various languages. ESS was used to measure the propensity for daytime sleepiness [14].

Statistical Analysis

Statistical analyses were performed using SPSS 20.0 for Windows. Descriptive statistics included numbers, percentages, means, standard deviations, minimum and maximum values, and medians. Student's t-test or the Mann-Whitney U test were employed to compare numerical variables between two independent groups based on normal distribution conditions. The chi-square test was used for rate comparisons among independent groups. Spearman's correlation analysis explored relationships between numerical variables due to non-parametric conditions. Linear regression analysis was used to investigate the determinant effects on numerical variables, and the significance level was set at $p<0.05$

Results

The mean age of the 57 participants in this study was 37.7±10.8 years, ranging from 18 to 67 years and the cohort was predominantly composed of females, with 51 individuals (89.5%). No significant difference in age was observed between the patient and control groups. However, female gender and PSQI scores were significantly higher in the patient group. A detailed comparison of demographics, education years, PSQI, and ESS scores between the patient and control groups is presented in Table 1. A statistically significant association was identified between education level and ESS, as outlined in Table 2. Exploring the collective impact of group assignment, gender, age, and education level on PSQI levels revealed that the group effect was the most significant factor (Table 3). No significant difference was observed between the PSQI and ESS scores ($p=0.603$). Upon jointly examining the group effect, gender, age, and education level impact on the ESS level, age and education level were identified as the most statistically significant factors (Table 4).

Discussion

This study aimed to examine the sleep quality and sleepiness scores of patients presenting to the emergency department (ED) with migraine attacks. The main findings were as follows: 1) Low sleep quality was significantly higher among patients who suffered from migraine than in the control group. 2) There

was a significant stastitical relationship between education level and sleepiness score. 3) No substantial differences were observed in the PSQI when comparing patient groups using the ESS. An examination of 1283 patients at a tertiary headache center revealed that more than half of the patients experienced occasional challenges with falling asleep and staying asleep, while over one-third reported experiencing these difficulties frequently [15]. In a meta-analysis of primary headaches that included 27.000 people, it was determined that the most common factor triggering migraine was sleep disturbance [16]. Shortening of sleep duration in migraine patients is inversely proportional to headache severity [17].

Table 1. Demographic and clinical characteristic features of participitans

Characteristics		Patients	Controls	p
Age mean±SD min.-max. (median)		37.7±10.8 18-67 (38)	33.4±12.9 18-60 (33)	0.121
Gender n (%)	Male	6 (10.5)	10 (40.0)	0.005
	Female	51 (89.5)	15 (60.0)	
Education level mean±SD min.-max. (median)		12.7±4.8 5-22 (12)	11.1±3.8 4-16 (12)	0.091
PSQI mean±SD min.-max. (median)		6.75±4.57 0-17 (6)	4.08±2.12 1-9 (3)	0.020
ESS mean±SD min.-max. (median)		4.35±4.83 0-22 (4)	3.24±3.73 0-13 (2)	0.465

Data are expressed as numbers (n), percentage (%), mean standard deviation (SD). Intergroup comparisons (control versus patients) were conducted using the chi-squared test, independent samples t-test, and Mann-Whitney U test, as appropriate,

PSQI: Pittsburgh Sleep Quality Index, ESS: Epworth Sleepiness Scale, Min.: Minimum, Max.: Maximum

Table 2. Correlations of PSQI and ESS with age and education level

	PSQI[1]		ESS[2]	
	r	p	r	p
ESS	0.058	0.603		
Age	0.104	0.352	0.114	0.310
Education level	0.001	0.993	0.294	0.007

[1]PSQI: Pittsburgh Sleep Quality Index, [2]ESS: Epworth Sleepiness Scale

Table 3. Multivariate linear regression analysis

	B	Beta	p
Stable	8.43		
Age	0.027	0.074	0.547
Gender	0.161	0.015	0.899
Educaiton level	-0.017	-0.019	0.875
Group	-2.636	-0.293	0.017

Dependent Variable: Pittsburgh Sleep Quality Index

Table 4. Multivariate regression analysis

	B	Beta	p
Stable	-3.259		
Age	0.102	0.259	0.034
Gender	-0.248	-0.022	0.856
Educaiton level	0.324	0.328	0.007
Group	-0.068	-0.007	0.953

Dependent Variable: Epworth Sleepiness Scale

Similarly, in our study, PSQI scores were significantly higher in the patient group than in the control group. In another study examining primary headaches and sleep disorders, the ESS score was not significant in the patient and control groups, which is consistent with the present study, with no significant difference in the ESS score between the patient and healthy control groups (p=0,465) [18]. The latest edition of the ICSD third edition encompasses sleep disorders classified into seven major diagnostic categories: insomnia, sleep-related breathing disorders, sleep-related movement disorders, central disorders of hypersomnolence, circadian rhythm sleep-wake disorders, parasomnia, and other sleep disorders [19]. Existing evidence suggests a bidirectional relationship between migraine and insomnia, which is not independent of anxiety and depression. Insomnia is a risk factor for migraine onset and exacerbation, leading to increased migraine impact, pain intensity, and chronification. Conversely, individuals with migraine are at higher risk of developing insomnia. However, this association may not be specific to migraine, as insomnia is broadly linked to headache [20]. Population-based studies have shown that the prevalence of obstructive sleep apnea syndrome (OSAS) is comparable between individuals with migraine and those without migraine [21]. Treatment of OSAS with continuous positive airway pressure has been linked improved sleep quality and migraine outcomes, including reductions in the frequency and intensity of attacks, duration of pain, days of incapacity to work, and intake of acute medication [22]. Results from a rural-based population study in Italy among adults showed a distinct correlation between migraine and restless legs syndrome (RLS), indicating a higher prevalence of migraine among individuals with RLS compared to those without (12.6% vs. 8.0%). A strong bidirectional relationship between migraine and RLS appears evident; however, the exact strength and direction of this association with narcolepsy remain uncertain due to insufficient available evidence. Although evidence supports an association between migraine and sleepwalking, determining the precise strength and nature of the association between migraine and parasomnia in adults remains challenging due to limited research [23]. The limited number of available studies and heterogeneity in the methodology used to define circadian rhythm sleep-wake disorders hinder reaching definitive conclusions regarding their relationship with migraine [20].

Study Limitations

This study has some limitations. Future research with a larger sample size is recommended. Additionally, although the PSQI and ESS tests provide subjective evaluations of sleep, the inclusion of polysomnography is suggested for the objective assessment of sleep disorders in diagnosed patients. Third, the sample of migraine patients presenting to the ED who may have suffered from severe pain may not adequately reflect the general migraine population.

Conclusion

The findings of this study highlight a substantial, standalone link between low sleep quality and a high likelihood of migraine attacks. Enhancing the evaluation of sleep quality by implementing the PSQI demonstrates its efficacy in the early prevention and treatment of migraine. Diagnosis and management of concurrent sleep disorders should be integrated into the treatment approach for migraine, as improvements in sleep quality are anticipated to lead to reductions in both the frequency and severity of headache.

Ethics

Ethics Committee Approval: Ethical clearance for the present study was granted by the Ethics Committee of the University of Health Sciences Türkiye, İstanbul Haseki Training and Research Hospital (approval number: 155-2023, date: 16.10.2023). The research adhered to the ethical principles outlined in the 1989 Declaration of Helsinki.

Informed Consent: The healthy participants were briefed on the study protocol and provided signed informed consent prior to participation.

Footnotes

Authorship Contributions

Concept: S.Ç., R.Ş., Design: S.Ç., R.Ş., Data Collection or Processing: S.Ç., R.Ş., Analysis or Interpretation: S.Ç., R.Ş., Literature Search: S.Ç., R.Ş., Writing: S.Ç., R.Ş.

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