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Evaluation of sleep quality in patients with idiopathic intracranial hypertension

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ABSTRACT

Objective: Idiopathic intracranial hypertension (IIH) is a condition that has no known cause and progresses with increased cerebrospinal fluid (CSF) pressure. Sleep apnea or other sleep disorders may occur with increased intracranial pressure (ICP). This study aims to determine the relationship between the signs and symptoms of IIH and sleep quality.

Patients and Methods: Three self-reported questionnaires, namely The Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale (ESS), and the Beck Depression Inventory (BDI)) were administered to 31 IIH patients and the same number of controls and the scores were compared. Scores were analyzed according to the presence of symptoms in the IIH group. The correlation of these scores with ICP was evaluated.

Results: Between the two groups, the IIH group had significantly higher PSQI scores (p=0.009). Also, a significant relationship was shown between papilledema and PSQI scores (p=0.017); patients with papilledema had lower PSQI scores than patients without papilledema. BMI values were higher in patients without papilledema (p = 0.031). In the IIH group, PSQI and BDI scores had a positive correlation (r = 0.638, p < 0.001).

Conclusion: Sleep quality is impaired in patients with IIH, and the effect of being overweight in this deterioration is more pronounced than presence of papilledema.

Keywords: Idiopathic intracranial hypertension, Sleep quality, cerebrospinal fluid pressure, Papilledema

1. INTRODUCTION

Idiopathic intracranial hypertension (IIH) is a condition in which cerebrospinal fluid pressure (CSF) is found to be elevated by lumbar puncture (LP) without an underlying cause such as an intracranial mass lesion or cerebral venous sinus thrombosis that could explain the increased intracranial pressure (ICP) [1]. The pathogenesis is unknown, but it is thought to result from a defect in CSF absorption ultimately. Overweight women of reproductive age are more affected [2]. It may present with headache, visual impairment, and pulsatile tinnitus, but the symptomatology is variable, leading to diagnosis delay [3]. Headache is reported in 75-99% of patients and does not have specific characteristics. Although, it may be in the vertex or suboccipital region, it is usually holocranial and may increase with awakening and the Valsalva maneuver [2].

Idiopathic intracranial hypertension and sleep disorders are linked with other diseases, such as headache and obesity, and it is estimated that the relationship between these two conditions arises from circadian rhythm or neurotransmitter changes [4]. The relationship between sleep quality and IIH is primarily associated with obesity-related obstructive sleep apnea (OSA) in adults. In OSA, apnea cycles are thought to cause episodes of hypoxemia and hypercapnia, leading to cerebral vasodilation and fluctuations in arterial blood pressure. As a result, an increase in ICP may lead to the development of papilledema [5].

In this study, we aimed to evaluate the quality of sleep in IIH patients and to reveal the relationship between IIH symptoms.

2. PATIENTS and METHODS

Between April 2023 and January 2024, 31 patients over 18 who were followed up with the diagnosis of IIH at the neurology

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outpatient clinic at Bezmialem Foundation University Hospital were included in the study. All included patients had previously applied to the outpatient clinic with a complaint of headache and were diagnosed with IIH after brain magnetic resonance imaging (MRI) and lumbar puncture. When the data obtained from the patient files were examined, CSF opening pressures of all patients after their first admission were above 200 mm H2O, and no other organic brain pathology that could increase ICP was detected on MRI findings. IIH was diagnosed according to the modified Dandy criteria revised in 2014 [6]. Thirty-one healthy volunteers older than 18 with normal neurologic examination were included in the control group. The study was approved by the Bezmialem Foundation University Hospital Clinical Research Ethics Committee (Approval No: E-54022451-050.05.04-102723, Date: 03.04.2023). All participants were informed verbally, their written informed consent was obtained, and the Declaration of Helsinki was followed in all procedures.

In the IIH group, gender, age, body mass index (BMI) and medical history (including symptoms of headache, nausea, blurred vision, diplopia, dizziness, tinnitus, transient blurred vision, and papilledema), neurological and ophthalmological examination findings were recorded. The patients were administered the Pittsburgh Sleep Quality Index to assess sleep quality (PSQI) [7], the Epworth Sleepiness Scale to determine sleepiness (ESS) [8], and the Beck Depression Inventory (BDI) to assess depressive tendencies, and the scores were recorded. Cerebrospinal fluid opening pressure was obtained from the patient's previous files. Demographic data and PSQI, ESS, and BDI scores were recorded in the control group. BMI values above 25 kg/m2 were considered overweight [9].

Statistical Analysis

We used SPSS software version 26 (IBM, Armonk, NY, USA) for statistical analysis. Frequencies and percentages represented categorical variables. Mean and standard deviation represented continuous variables that follow a normal distribution. For non-normally distributed data, values were presented as medians with minimum and maximum values. Shapiro-Wilk test was performed to assess if data followed a normal distribution. For normal distributions, an independent-sample t-test was used to compare quantitative data. For non-normal distributions, a Mann-Whitney U test was employed. The statistical significance level was 0.05.

3. RESULTS

Twenty-nine women (93.5 %) and two men (6.5 %) were in the IIH group. There were 31 individuals, and the same proportion of women (93.5 %) and men were in the control group. The mean ages of the IIH and healthy controls were 39.90 ± 10.22 and 39.77 ± 10.26 years, respectively (p = 0.961). IIH and healthy controls had mean BMI values of 25.03 ± 1.91 kg/m2 and 23.11 ± 1.83 kg/m2, respectively (p = 0.000) (Table I). The most common symptom was a headache (96.8 %, n = 30). Other symptoms included tinnitus (16.1%, n = 5), transient visual obscuration (19.4%, n = 6), blurred vision (25.8%, n = 8), diplopia (6.5%, n = 2), dizziness (16.1%, n = 5), nausea (19.4%, n = 6). Bilateral papilledema was detected in 23 patients (74.2%). Fourteen of the IIH patients were overweight and 9 (64 %) of these patients had papilledema.

Table I. *Demographic characteristics of the IIH group and the control group.*

	IIH = 31	Controls = 31	P
Sex, n (%)			
Male	2 (6.5)	2 (6.5)	
Female	29 (93.5)	29 (93.5)	1,000[a]
Age, years (mean ± SD)	39.90 ± 10.22	39.77 ± 10.26	0,961[b]
BMI, kg/m^2 (mean ± SD)	25.03 ± 1.91	23.11 ± 1.83	**0.000**[b]

[a]Chi-Square test, [b]Independent-sample t-test, IIH: Idiopathic intracranial hypertension, SD: Standard deviation

When comparing the IIH group and healthy individuals, the PSQI total score was significantly higher in the IIH group (p = 0.009). ESS and BDI scores showed no significant difference (p > 0.05) (Table II).

Table II. *Comparison of PSQI, ESS, and BDI scores of IIH and control group*

	IIH = 31	Controls = 31	P[a]
PSQI, median (min-max)	8 (4-19)	6 (0-15)	**0.009***
ESS, median (min-max)	6 (0-18)	5 (0-18)	0.198
BDI, median (min-max)	15 (0-41)	11 (0-54)	0.133

[a]Mann-Whitney U test, PSQI: Pittsburgh Sleep Quality Index, ESS: Epworth Sleepiness Scale, BDI: Beck Depression Inventory, min: minimum, max: maximum

When PSQI, ESS, and BDI scores were compared according to the presence of symptoms, the IIH group had significantly higher PSQI scores in patients without papilledema (p=0.017). No significant relationship was observed between other symptoms and scale scores (p > 0.05). These scores could not be compared with the presence of a headache because only one person did not have a headache (Table III). When patients with papilledema were compared with patients without papilledema, age was significantly lower in patients with papilledema (p=0.039). It was observed that BMI values in patients without papilledema were significantly higher than in the group with papilledema (p=0.031) (Table IV).

In the IIH group, the mean CSF opening pressure was 335.4 ± 64.8 mm H2O (min-max: 240–470). There was no correlation between PSQI, ESS, and BDI scores and CSF opening pressures (Table V). When the relationship between scale scores was evaluated, a positive correlation was observed between PSQI scores and BDI scores in the IIH group (r = 0.638, p<0.001).

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Table III. *The relationship between the presence of symptoms and PSQI, ESS, and BDI scores.*

		PSQI		ESS		BDI	
		median (min-max)	P[a]	median (min-max)	P[a]	median (min-max)	P[a]
Papilledema	**No (n=8)**	14.5 (8-16)	**0.017***	5 (1-12)	0.277	20 (7-37)	0.240
	Yes (n=23)	8 (4-19)		6 (0-18)		14 (0-41)	
Tinnitus	**No (n=26)**	8 (4-18)	0.765	6 (0-18)	0.590	15 (0-37)	0.389
	Yes (n=5)	8 (4-19)		5 (3-8)		25 (1-41)	
Transient Visual Obstruction	**No (n=25)**	8 (4-19)	0.189	5 (0-14)	0.304	14 (0-41)	0.707
	Yes (n=6)	10 (8-18)		11.5 (1-18)		18.5 (0-28)	
Diplopia	**No (n=28)**	8 (4-19)	1.000	5 (0-18)	0.545	15 (0-41)	0.717
	Yes (n=2)	10 (4-16)		7 (6-8)		13 (0-25)	
Dizziness	**No (n=26)**	8 (4-19)	0.892	5.5 (0-18)	0.686	15 (0-41)	0.146
	Yes (n=5)	8 (7-14)		6 (4-14)		31 (7-37)	
Blurry vision	**No (n=23)**	8 (4-19)	0.616	5 (0-14)	0.167	14 (0-41)	0.821
	Yes (n=8)	9.5 (4-18)		7.5 (1-18)		18.5 (1-28)	
Nausea	**No (n=25)**	8 (4-19)	0.245	5 (0-18)	0.920	15 (0-41)	0.920
	Yes (n=6)	12.5 (4-16)		6 (2-16)		18.5 (0-37)	

[a]Mann-Whitney U test, PSQI: Pittsburgh Sleep Quality Index, ESS: Epworth Sleepiness Scale, BDI: Beck Depression Inventory, min: minimum, max: maximum

Table IV. *Demographic characteristics of the patients with papilledema.*

	Patients with Papilledema n= 23	Patients without Papilledema n= 8	P
Sex, n (%)			
Male	2 (6.5)	0 (0)	
Female	21 (91.3)	8 (100)	0.389[a]
Age, years (mean ± SD)	37.70 ± 10.02	46.25 ± 8.34	**0,039**[b]
BMI, kg/m^2 (mean ± SD)	23.89 ± 2.22	26.40± 2.10	**0.031**[b]

[a]Chi-Square test, [b]Independent-sample t-test, IIH: Idiopathic intracranial hypertension, SD: Standard deviation

Table V. *Correlation between CSF opening pressure (mm H_2O) and PSQI, ESS, and BDI scores in the IIH group.*

	Spearman correlation coefficient, rho	P
PSQI	0.048	0.799
ESS	0.151	0.417
BDI	-0.069	0.711

CSF: Cerebrospinal fluid, PSQI: Pittsburgh Sleep Quality Index, ESS: Epworth Sleepiness Scale, BDI: Beck Depression Inventory

4. DISCUSSION

The present study showed that sleep quality is impaired in IIH patients. The clinical characteristics and pathophysiological features of patients with IIH and patients with sleep disorders overlap significantly. Obesity is an important risk factor for both conditions [10]. Studies also have extensively demonstrated the association between headache and sleep disturbance [11]. The association of primary headache syndromes with sleep disorders has been attributed to neurotransmitter or circadian rhythm changes [12]. Headache is the most accompanying symptom of IIH [13]. Lateralized throbbing pain may be aggravated by posture changes such as lying down. Headache often occurs on awakening [14]. The evidence that ICP rises during sleep is well established and was first demonstrated polygraphically in l966 [15]. Elevated ICP during sleep is explained by alterations in blood or CSF volume. The increase in ICP during rapid eye movement (REM) sleep secondary to an increase in cerebral blood volume has been associated with decreased sympathetic tone. In addition, decreased alveolar ventilation during sleep may also cause an increase in ICP [16]. Alperin et al., observed decreased jugular venous drainage and increased interstitial fluid volume in the gray matter in obese patients with IIH [17]. In the present study, the mean BMI of the IIH group was above 25 kg/m2. Except for one patient, all other patients described headaches. It is thought that these two conditions contribute to the deterioration in sleep quality.

Kornbluh et al., compared sleep problems in sixty-two pediatric IIH patients with a control group using the Child Sleep Habits Questionnaire. Statistically significant differences were found in total sleep disturbance score (p =.035), sleep onset delay (p =.014), parasomnias (p =.013), and sleep-disordered breathing (p =.013). The study showed that pediatric IIH was associated with increased sleep disturbances [15]. In a study conducted by Latzer et al., the sleep disorders in 33 adolescents with IIH and controls were compared using the School Sleep Habits Survey (SSHS), the Pediatric Sleep Questionnaire (PSQ), and the depression scale. Sleep disturbances were significantly higher in the IIH group (SSHS, $p < 0.001$; PSQ, $p < 0.001$). Sleep-related breathing problems ($p = 0.006$), sleepiness during the daytime

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(p = 0.04), sleep/wake disruptions (p < 0.001), and depressive complaints (p < 0.001) were also significantly higher in the IIH group. Sleep disturbance has been observed to be common in the IIH group, regardless of weight and symptomatology [4]. Consistent with these results, we showed that PSQI scores were significantly higher in the IIH group. PSQI consists of components assessing sleep quality, duration, efficiency and latency, sleep disturbance, use of medication for sleep, and dysfunction during the daytime, and the total score indicates a global sleep quality/disorder score. Higher scores indicate a more marked deterioration in sleep quality [18].

Compliance with Ethical Standards

Ethical approval: The study was approved by the Bezmialem Foundation University Hospital Clinical Research Ethics Committee (Approval No: E-54022451-050.05.04-102723, Date: 03.04.2023). All participants were informed verbally, their written informed consent was obtained, and the Declaration of Helsinki was followed in all procedures.

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