The Correlation between the Chronicity of Pain and Sleep Quality in the Most Common Types of Headache

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Abstract

Objective: Migraine and tension type headache are the most common types of headache in the general population. In this study, our goal is to examine the relationship between sleep quality and headache types and the association between the Chronicity of pain.

Methods: The Epworth sleepiness scale and Pittsburgh sleep quality index surveys were performed together and applied to 50 patients with migraine, 50 patients with tension type headache and 50 healthy control people. The patients were divided into two groups consisting of chronic and episodic types of headache.

Results: Daytime sleepiness was increased in patients with either migraine or tension type headache in the chronic group, and the quality of sleep of patients with migraine, chronic, episodic migraine, tension type headache and episodic TTH was significantly worse than the control group. In both migraine subgroups the time of quality sleep were worse than TTH.

Conclusions: Pain can diminish the quality of sleep, while poor quality of sleep can increase the pain severity. Sleep quality is important to improve treatment strategies and to increase the knowledge of primary headaches pathophysiology.

INTRODUCTION

Headache, sleep disturbance and daytime sleepiness are symptoms that commonly show co morbidity. Many sleep disorders have been diagnosed more often in patients with primary headaches [1]. Sleep-related symptoms, such as fatigue and yawning, can occur before a migraine attack and can also trigger migraine attacks in the case of insufficient sleep [2]. Sleep is regulated by complex mechanisms in the brain stem and hypothalamus, and many neurotransmitters, such as serotonin, adenosine, histamine, hypocretin, GABA, nor epinephrine, and epinephrine, play a role in sleep regulation [3]. Sleep deprivation or disruption can lead to many problems, such as exhaustion, fatigue, somnolence, headache, anxiety, impaired concentration, confusion, cognitive disorders, and learning difficulties. Migraine and tension type headache are the most common types of headache in the general population. The incidence of migraine is 16.4 % according to a large population-based epidemiological study conducted in Turkey. Ten percent of people with migraine have chronic migraine (CM) [4]. Chronic migraine (CM) and episodic migraine (EM) have been shown to be associated with psychiatric and medical disorders and in particular, the relationship between CM and co morbid diseases is higher than that of EM [5]. The diagnoses of migraine and tension type headache are often interchanged with one another. However, tension type headaches (TTH) are rarely as severe as migraine. The pain in TTH more often has blunt characteristics and is triggered by common stress. Patients can suffer from both types of headaches at different times and may confuse the pain of headache types. Therefore, patients should be questioned thoroughly. Sleep disorders and headaches have begun to be examined together due to complaints from patients that sleep disorders have caused headaches and in turn, headaches have caused sleep disorders. The relationship between specific and non-specific headaches and sleep disorders has been
investigated in many epidemiological and clinical studies. In this study, we aimed to compare sleep quality and daytime sleepiness by comparing patients with chronic and episodic types of migraine without aura and TTH with a control group and the other respective groups. In addition, we aimed to evaluate the relationship between the Chronicity of headaches and sleep quality.

**MATERIAL AND METHODS**

**Participants**

A total of 100 patients diagnosed with migraine or TTH according to the International Classification of Headache Disorders (ICHD II) [6] were included in the study after a detailed history investigation and neurological examination by a neurologist between June 2013–June 2014. Patients between 18-45 years of age who were treated at the neurology department after complaints of headache and the control group was composed of healthy volunteers without headache who visited our hospital for a medical checkup and were age- and sex- matched with the study group. The exclusion criteria for control group were (1) presence of family migraine history, (2) any systemic disease, or (3) any history of psychiatric diseases. Patients who were using prophylactic drugs for migraine or TTH, taking regular medication due to any psychiatric disorder, or suffering from sleep apnea syndrome with a known and definitive diagnosis were excluded from the study. Individuals who suffered from fewer than 5 short-term headaches per year comprised the control group. All patients were questioned regarding the average frequency of headaches during one month, and the results were noted. Patients with 15 or more headaches within one month were considered to be CM and chronic TTH (CTTH). Face to face interviews were conducted for the patients and healthy controls to determine the quality of daytime sleepiness and sleep quality at night.

**Questionnaire**

To screen for excessive daytime sleepiness (EDS), we used the Epworth Sleepiness scale (ESS), an eight item self-administered questionnaire that is used as an instrument to evaluate the tendency to fall asleep during the daytime during eight different conditions (e.g., while sitting and reading, riding as a passenger in a car, sitting and talking to someone). EDS was defined as an ESS score > 10 [7]. The quality of sleep was measured using the Pittsburgh Sleep Quality Index (PSQI), a self-rated questionnaire grouped into seven categories and scored on a zero to three point scale that assesses various factors related to sleep quality, including estimates of sleep duration and latency and frequency and severity of specific sleep problems. The sleep component scores are summed to yield a total score ranging from 0 to 21, with higher total or global scores indicating poor sleep quality. Participants with a global score greater than 5 were classified as poor sleepers. Those with a score of 5 or less were classified as good sleepers [8]. According to the diagnostic criteria of the Pittsburgh sleep quality index, we categorized the duration of falling asleep into 4 groups (patients fall asleep in < 15 minutes: 0, 16-30 minutes: 1, 31-60 minutes: 2, > 60 minutes). Sleep efficiency is categorized as: > 85%, 75-84%, 65-74%, < 65% in to 4 groups.

**Statistical analysis**

NCSS (Number Cruncher Statistical System) 2007 and PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) were used for statistical analysis. Individual level Univariate analyses were performed to compare baseline characteristics. ANOVA (for continuous variables) and chi-squared tests (for categorical variables) were used to compare the three implementation groups. Descriptive statistics are presented as means, standard deviations and percentages. For the diagnostic categories in the Pittsburgh sleep quality index, descriptive statistical methods (frequency and rate) as well as Pearson’s chi-square test, the Fisher-Freeman-Halton test, and the Yates Continuity Correction test (Yates-corrected chi-square) were used in the comparison of qualitative data. Significance was evaluated at the p < 0.01 and p < 0.05 levels. Cronbach’s alpha was utilized to evaluate internal questionnaire consistency in the study population.

All analyses were performed with SPSS for windows version 16. A two sided p value < 0.05 was considered to be statistically significant.

**Ethics**

The study was approved by the local ethics committee, and signed consent forms were obtained from all patients prior to the survey (voucher no: 14/05/2013//180).

**RESULTS**

No significant difference was detected between the migraine, TTH and control groups in terms of age, gender and frequency of headaches (Table 1). As an assessment of internal consistency, Cronbach’s alpha equaled 0.78 and 0.72 for the ESS and PSQI instruments respectively in this study sample. This represents as satisfactory levels of internal consistency.

**Daytime sleepiness in patients**

Daytime sleepiness of headache patients and the control group was compared, the total migraine, total TTH, CM and CTTH groups showed significantly more sleepiness than the control group, but there was no significant difference between the episodic groups and the control group (Table 2). The difference in daytime sleepiness between the migraine and TTH patient groups was not significant (p=0.461).

**Quality of sleep according to PSQ in patients**

**Sleep Quality:** When the quality of sleep of patients with migraine, chronic migraine (CM), episodic migraine (EM), tension type headache and episodic TTH (ETTH) were compared with that of the control group, the results showed that significant differences were obtained (p = 0.001, p = 0.001, p = 0.001 and p = 0.023, respectively) (Table 2). When we compared the patients with TTH and migraine, the quality of sleep of patients with migraine was significantly worse (p= 0.001). The quality of sleep was reduced in all of the 22 CM patients (100%). The quality of sleep was reduced in 9 (32.14%) of the 28 patients with EM (p=0.001).

**Sleep latency**

While no statistically significant difference was observed...
between subjects with EM and CM regarding sleep latency (p = 0.913), significant differences were detected in the comparison of these two groups with the healthy control group (p = 0.001, p = 0.001, respectively). No statistically significant difference was found between the sleep latency in the subjects with ETTH and CTTH (p = 0.055). However, a statistically significant difference was detected ETTH and the control group, but there was no significant difference between the CTTH and control groups (p = 0.001, p = 1.000, respectively). CM group’s sleep latency was statistically longer than CTTH group but in ETTH group the sleep latency was longer than EM group but this was statistically not significant (p=0.002, p=0.042, respectively) (Table 3).

Sleep efficiency

There was no statistically significant difference between ETTH and CTTH groups (p = 1.000). No significant difference was observed in the comparison of both the patients of ETTH and CTTH with the control group (p = 0.783, p = 0.715, respectively) as in other subgroups there were statistically significant difference between EM and ETTH, CM and CTTH (P=0.034, P=0.001 respectively) in both migraine subgroups the sleep efficiency were worse (Table 4).

The frequency of sleep medication use

The only statistically significant difference was shown in CM group; the drug use was more than CTTH and the control groups in CM patients (P=0.032, P=0.002 respectively).

**DISCUSSION**

The International Classification of Headache Disorders (ICHD II) [6] includes two specific diagnoses for sleep-related headaches, “sleep apnea headache” and “hypnic headache”. At the same time, sleep disorders may still be associated with other primary headaches, especially TTH and migraine. This study has shown that sleep quality and day time sleeplessness of patients with migraine and TTH were varied with respect to the healthy control group. The relationship between headache and sleep disorders such as daytime sleepiness, insomnia, snoring, and apnea has been evaluated in previous studies [9-15]. In our study, while daytime sleepiness was found to be significantly higher in patients with migraine than in the healthy population, no significant difference was detected between the patients with EM and the control group, but there was a significant difference between patients with CM and the control group. The relationship was similar in patients with TTH. It may be suggested that daytime sleepiness in patients with migraine and TTH increases with the Chronicity of pain. Sleepiness was evaluated as a symptom that can be observed at different stages of migraine progression. In previous studies there are different results about daytime sleepiness in migraine and TTH. In the study by Barbanti et al., 100 patients with only EM; sleepiness was observed more often in the patients with migraine than control group (20% versus 6%, odds ratio 3.92, 95% CI 1.5-10.22) [12]. In Third Nord-Trondelag Health Study Odegard et al. (2010), investigating the relationship between headache types and sleep disorders, found that daytime sleepiness and various sleep disorders occur five times more often in migraine headache patients than in patients without headaches. Sleep disorders were detected three times more often in subjects with TTH than in subjects without headaches. While sleep disorders were detected 17 times more often in patients with chronic headache than in control subjects, this ratio was significantly higher in patients with CM than in patients with CTTH [13]. In the results of another study the relation between the frequency of headache and EDS were found higher in CM group [16]. Seidel et al. reported that daytime sleepiness did not differ in migraine patients from controls [17]. The relationship between pain and sleep is complex in people with chronic pain. Pain may reduce the quality of sleep or poor quality sleep can increase the severity of pain, not only for headaches, but for all types of pain. The most common cause of awakening from sleep in fibromyalgia patients is intense muscular pain [18]. Additionally, it should be noted that analgesics used for pain might contribute
to sleep disorders by reducing slow sleep wave and REM sleep [19]. Karthik et al. (2012) compared 90 patients with migraine without aura under prophylactic treatment to 1150 individuals of the general population using the Pittsburgh sleep quality scale and the Epworth sleepiness scale. Sleep quality in the patients with migraine was reduced in 66.7% of the patients, and it was reduced in 7.8% of the control group. Increased daytime sleepiness was present in 14.4% of the patients with migraine (ESS score > 10) and 1.1% of the general population [20]. Sanda et al. (2010) studied 105 patients with chronic eadache (80 patients with medication overuse, 21 patients with chronic migraine, and 4 patients with chronic tension-type headache) and 102 patients with episodic headache and found that sleep disorders, inomnia, daytime sleepiness, and snoring were found significantly more often in the patients with chronic headache than in the episodic group [21]. In a study performed by Selekleer et al. in Turkey in 2010 the sleep qualities of patients with CM and EM were compared; maintaining sleep was more difficult, total sleep time was shorter, and waking-up tired in the morning was experienced at a higher rate in subjects with CM than in the control group [22]. In our study, the quality of night sleep was significantly reduced in the comparisons of both migraine groups. Although the quality of sleep (PSQI ≥5) was reduced in all 22 CM patients (100%), it was reduced in 9 (32.14%) of the 28 patients with EM. Therefore, both daytime sleepiness and the quality of sleep deteriorated when patients entered the chronic pathway in migraine. While there was a significant reduction of sleep quality in patients with TTH compared to the control group, this reduction was higher in episodic group than chronic group. Interestingly, unlike the migraine group, the quality of the sleep in the episodic group was worse than that of the chronic group. Several studies have illustrated positive correlations between TTH and sleep disturbances [13,23]. Nevertheless, some studies have shown no correlation [24]. The effect of the sleep-wake cycle on pain has been tested in animal models. It was observed that the length of the transition period to sleep was increased, REM and NREM stages were shortened, the number of awakenings during night was increased, and sleep efficiency was decreased in animal models of chronic pain [25,26].

The latency of sleep was longer and the efficiency of sleep was worse in CM groups than CTTH. In EM group the efficiency of sleep was also worse than ETTH. These results indicate that in migraine groups the Chronicity of pain affected sleep more than TTH groups. By the way the TTH groups were having the same efficiency of sleep with the control group. The medication use in migraine groups the Chronicity of pain affected sleep more than TTH groups. By the way the TTH groups were having the same efficiency of sleep with the control group.

The limitations of this study were that co-morbid conditions accompanying sleep were not investigated and it would be better to add PSG findings of the groups. Unfortunately the laboratory conditions were not able to make an appointment to all of the patients. Despite all the diagnoses of patients enrolled by neurologists TTH may able to mimic other headaches. There is no objective evidence of sleepiness. Patients with chronic pain have heightened symptoms, and may report more sleepiness than objectively demonstrated. There was not a power analysis done to show that 100 patients were enough to demonstrate a significant difference in the ESS between the groups. With 5 groups of subjects, the lack of difference might be to lack of power.

However, the present study differs from previous studies in that it is a case-control study and includes migraine and TTH sub-groups.

Table 3: Evaluation of the Sleep latency According to Group.

<table>
<thead>
<tr>
<th></th>
<th>Episodic Migraine(^1) (n=28)</th>
<th>Chronic Migraine(^2) (n=22)</th>
<th>Episodic TTH(^3) (n=35)</th>
<th>Chronic TTH(^4) (n=15)</th>
<th>Healthy Control(^5) (n=50)</th>
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<tbody>
<tr>
<td><strong>Time falling asleep at night</strong></td>
<td></td>
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<tr>
<td>0-15 min</td>
<td>17 (%60.7)</td>
<td>12 (%54.5)</td>
<td>29 (%82.9)</td>
<td>14 (%93.3)</td>
<td>47 (%9)</td>
</tr>
<tr>
<td>16-30 min</td>
<td>8 (%28.6)</td>
<td>8 (%36.4)</td>
<td>0 (%0.0)</td>
<td>1 (%6.7)</td>
<td>3 (%6.0)</td>
</tr>
<tr>
<td>31-60 min</td>
<td>2 (%7.14)</td>
<td>2 (%9.1)</td>
<td>4 (%11.4)</td>
<td>0 (%0.0)</td>
<td>0 (%0.0)</td>
</tr>
<tr>
<td>≥60 min</td>
<td>1 (3.57)</td>
<td>0 (%0.0)</td>
<td>2 (5.7)</td>
<td>0 (%0.0)</td>
<td>0 (%0.0)</td>
</tr>
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</table>

**Binary Comparisons:** \(^1\)p=0.913; \(^2\)p=0.001; \(^3\)p=0.01; \(^4\)p=1.000; \(^5\)p=0.055;
\(^1\)p=0.01; \(^2\)p=0.001; \(^3\)p=0.055; \(^4\)p=1.000; \(^5\)p=0.055
Fisher-Freeman-Halton Test; \(^p<0.05\), \(^p<0.01\)

Table 4: Evaluation of the Sleep efficiency (%) According to Group.

<table>
<thead>
<tr>
<th></th>
<th>Episodic Migraine(^1) (n=28)</th>
<th>Chronic Migraine(^2) (n=22)</th>
<th>Episodic TTH(^3) (n=35)</th>
<th>Chronic TTH(^4) (n=15)</th>
<th>Healthy Control(^5) (n=50)</th>
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<tbody>
<tr>
<td><strong>Ratio of Quality Sleep</strong></td>
<td></td>
<td></td>
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<tr>
<td>≥85</td>
<td>8 (%28.5)</td>
<td>3 (%13.6)</td>
<td>10 (%38.6)</td>
<td>5 (%33.4)</td>
<td>24 (%48.0)</td>
</tr>
<tr>
<td>%75-84</td>
<td>8 (%28.5)</td>
<td>3 (%13.6)</td>
<td>19 (%53.4)</td>
<td>8 (%53.3)</td>
<td>15 (%30)</td>
</tr>
<tr>
<td>%65-74</td>
<td>11 (%39.3)</td>
<td>11 (%50.0)</td>
<td>6 (%17.1)</td>
<td>2 (%13.3)</td>
<td>11 (%22.0)</td>
</tr>
<tr>
<td>≤65</td>
<td>1 (%3.6)</td>
<td>5 (%22.7)</td>
<td>0 (%0.0)</td>
<td>0 (%0.0)</td>
<td>0 (%0.0)</td>
</tr>
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</table>

**Binary Comparisons:** \(^1\)p=0.037; \(^2\)p=0.082; \(^3\)p=0.001; \(^4\)p=1.000; \(^5\)p=0.783; \(^6\)p=0.715
Fisher-Freeman-Halton Test; \(^\text{Yates Continuity Correction Test}\); \(^p<0.05\), \(^p<0.01\)
In this study, we reviewed the relationship between sleep and forms of migraine and TTH that are most commonly observed in primary headaches and found that both the quality of sleep was disrupted and daytime sleepiness was increased in patients with migraine patients especially when they entered the chronic pathway. If CM cause more interrupted sleep and reduce sleep quality, the priority should not be only to treat the headache, but to choose a treatment that will not affect sleep patterns, especially in chronic migraine patients.

Our results support that while the daytime sleepiness increases in CM and CTTH, sleep quality get worsen in only CM not in CTTH. The mechanism underlying this association is not clear. Both daytime sleepiness and poor sleep quality may be the result of headache or the reason. Further studies of physiological patterns of sleep quality and headache are needed to confirm the study findings and to enrich our understanding of their interactions.

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All authors declare that there are non-financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other) in relation to this manuscript.

REFERENCES


