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The Relationship Between Sleep Quality and Headache Intensity in Migraine Patients Referred to Affiliated Centers of Babol University of Medical Sciences Centers in 2020

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Abstract
Migraine is the second most common cause of headache, which itself and Its complications have a high burden on the community. The aim of this study was to investigate the relationship between sleep quality and headache severity in patients with migraine. The present descriptive cross-sectional study was performed on 200 patients
referred to the clinic and neurology ward of Ayatollah Rouhani Hospital in Babol, who was diagnosed with a migraine by a neurologist. Patients completed three questionnaires which were Migraine Impairment and Disability Assessment (MIDAS), VAS to assess headache severity, and Pittsburgh Sleep Quality Index (PSQI). Data were collected in SPSS software and analyzed by Kruskal-Wallis and Mann-Whitney tests.
The mean age of patients was 32.93 ± 8.12 years, the mean time of migraine diagnosis patients were generally 8.55 ±7.53 years, and the mean pain severity according to the VAS questionnaire was 6.49 ± 2.24, and the mean PSQI score was 12.44 ± 2.91. The
findings showed that sleep quality was not associated with headache severity, duration of migraine, presence of aura, age, and severity of migraine disability, but sleep quality was poorer in women than men. Women were also poorer in the areas of mental quality of sleep, sleep efficiency, and sleep disorders.
The findings of the present study showed that people with migraines generally have poor sleep quality. Poor sleep quality is more pronounced in women. However, there was no significant relationship between migraine severity, headache severity, and its presence with sleep quality.

Keywords: Headache, Migraine disorders, Sleep quality.

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1. Introduction

Headaches are a prevalent reason for doctor visits [1], with migraines being the second most common type after tension headaches [2,3]. Migraines affect around 15% of women and 6% of men, characterized by recurrent, one-sided, throbbing pain often accompanied by nausea, photophobia, and phonophobia [4,5]. About 15-20% of migraines occur with an aura. Migraines significantly impact the quality of life and productivity, especially in women aged 25-34 [6]. They typically last between 4 to 72 hours and cause symptoms like nasal congestion, visual disturbances, diarrhea, abdominal cramps, abnormal temperature sensations, anxiety, depression, irritability, and concentration difficulties [7]. Around 53% of sufferers report that migraines interfere with daily activities, affecting work and family relationships [8]. Migraine is considered a sensory processing disorder with both neurological and vascular components, involving brain structures like the cortex and brainstem [9].

Globally, approximately 10% of the population suffers from migraines. They can begin at any age but rarely before age 5, most commonly affecting adolescents and young adults, with a higher prevalence in women [10]. About 67% of migraine sufferers have a family history of the disorder. Migraine prevalence is higher in urban areas than in rural ones [9]. According to the World Health Organization, migraines rank 12th among women and 19th overall in terms of disability due to headaches [11,12].

Anatomical and neurophysiological structures related to headaches and sleep are interconnected, indicating a recognized correlation between specific headache diagnoses and sleep disorders [13,14]. Epidemiological and clinical studies show a close relationship between migraines and sleep disorders, with both often coexisting in patients [15-17]. Both insufficient and excessive sleep can trigger migraine attacks [18,19]. Modern urban lifestyles, characterized by stress, contribute to the prevalence of headaches. Over 90% of people experience at least one headache annually [1]. Headaches result from the tension, displacement, inflammation, spasm, and dilation of pain-sensitive structures in the head or neck [2,3]. Migraines, the most common chronic headache, often begin in childhood, adolescence, or early adulthood, with frequency decreasing with age [6,7].

Migraine is a chronic condition marked by severe, disabling headaches, often affecting one side of the head and accompanied by symptoms like nausea, vomiting, and visual disturbances. These attacks can last from 2 to 72 hours, occurring as frequently as weekly or as infrequently as once a year. Migraines are more common in women and may have a hereditary component. They typically start around puberty and decrease in severity and frequency in middle age. Migraine attacks often begin in the morning, with early symptoms including visual disturbances [18].

Various risk factors for migraines include genetics, gender, and age. Women are more likely to suffer from migraines, especially with a family history of the condition [20]. Lifestyle factors like ineffective acute treatment, overuse of migraine medications, obesity, and stressful life events can increase the risk of transitioning from episodic to chronic migraines [20,21,22]. Education on managing migraines through medication, exercise, and stress management is crucial for patients [23,24].

The exact mechanism of migraines is not fully understood. The vascular theory suggests migraines involve the contraction and subsequent dilation of blood vessels in the brain [25]. However, the neurovascular hypothesis, which is more accepted, indicates that migraines originate from the trigeminovascular system, involving the release of vasoactive neuropeptides

leading to inflammation and pain [26]. Recent research has led to the development of new treatments targeting CGRP and serotonin receptors [27].

There is a significant bidirectional relationship between sleep disorders and migraines. Poor sleep quality or inappropriate sleep duration can trigger migraines, while migraines can disrupt sleep, creating a vicious cycle [28-31]. Studies have shown that individuals with migraines report poorer sleep quality and increased headache frequency. Different sleep disorders, such as insomnia, sleep apnea, restless legs syndrome, and circadian rhythm disorders, are commonly associated with migraines [32,33].

The primary objective of this study is to investigate the relationship between sleep quality and headache severity in migraine patients. Secondary objectives include examining the relationship between sleep quality and headache duration, the presence of aura, gender, age, and migraine-related disability. Understanding the factors influencing headache severity and disability in migraine patients, as well as their sleep quality, can lead to more comprehensive treatment plans. Addressing sleep disorders in migraine patients could significantly reduce headache severity and related complications.

2. Methods

The study was a cross-sectional analytical investigation. The research population consisted of individuals suffering from migraine headaches. All patients who visited the neurology clinic of Ayatollah Rouhani Hospital within one year from April 2019 to March 2020 and were diagnosed with migraines by a neurologist were selected as the research sample. The inclusion criteria were patients aged over 18 and under 50 years, diagnosed with migraine headaches by a neurologist based on ICHD and IHS criteria, and willing to participate in the study. Exclusion criteria included patients unwilling to participate or those who were illiterate, patients with underlying diseases causing sleep disorders, individuals with severe physical illnesses such as cancer, individuals with chronic physical diseases, patients taking medications affecting sleep, patients with serious psychiatric and cognitive disorders, patients working in shifts, patients with medication overuse headaches, and patients with mixed migraine headaches. The sample size was determined using the formula:

$$n = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right)^2}{(\omega)^2} + 3$$

With a confidence level of 95% and a power of 80%, assuming r=0.2 for the correlation between pain severity and sleep quality scores, the sample size was estimated to be about 200. The sampling method used in this study was a non-probability census. The research was conducted at Ayatollah Rouhani Hospital.

Data Collection

Patients visiting the neurology clinic and diagnosed with migraines according to IHS or ICHD criteria were asked to participate in the study. After obtaining informed consent and completing the consent form, they were given a questionnaire. Assistance was provided to those who had difficulty completing the questionnaire. The questionnaire included demographic questions (age, gender, duration of migraine, presence or absence of aura), pain severity based on the Visual Analogue Scale (VAS), disability severity based on the Migraine Disability Assessment (MIDAS) questionnaire, and sleep quality based on the Pittsburgh Sleep Quality Index (PSQI). Due to the COVID-19 pandemic, contact information for 100 patients was collected, and the

questionnaire was sent to them online. Follow-up calls were made at 48 and 96 hours to ensure completion, and all patients responded fully without any dropouts.

2.1. Instruments

Migraine Disability Assessment (MIDAS) Questionnaire:

The MIDAS questionnaire, developed by Lipton et al., assesses various aspects of disability caused by migraine and tension headaches. Its validity and reliability have been confirmed in multiple countries, including Iran, where Zandifar et al. reported a Cronbach's alpha of 0.82 for migraines and 0.72 for tension headaches (34).

2.2. Pittsburgh Sleep Quality Index (PSQI):

The PSQI assesses sleep quality over the past month and consists of 18 items. Its high validity and reliability have been demonstrated in numerous studies. In Iran, Hassanzadeh et al. confirmed its validity and reliability with a Cronbach's alpha ranging from 0.78 to 0.82. The PSQI scores each of its 7 components from 0 to 3, with higher scores indicating poorer sleep quality. A total score greater than 5 indicates poor sleep quality [35].

2.3. Data Analysis

Collected data were entered into Excel for statistical analysis preparation. Descriptive statistics, including central indices (mean, median, mode) and dispersion indices (variance, standard deviation, range, coefficient of variation) for quantitative variables, as well as frequency, percentage, and prevalence for qualitative data, were used. Necessary charts (bar and pie) were drawn. For inferential statistics, parametric tests (t-test, chi-square) and non-parametric tests (Mann-Whitney) were used after checking data normality to test the study hypotheses. All analyses were performed using SPSS version 25, with a significance level of $p<0.05$.

Table 1. Variables

Variable Name	Variable Type	Variable Scale	Variable Role	Unit of Measurement
Age	Discrete Quantitative	Ratio	Independent	Years
Gender	Quantitative	Nominal	Independent	Male/Female
Education Level	Quantitative	Ordinal	Independent	Below diploma/Above diploma
Marital Status	Quantitative	Nominal	Independent	Single/Married
Employment Status	Quantitative	Nominal	Independent	Housewife/Employee/Other
Sleep Quality	Quantitative	Ordinal	Dependent	Poor/Moderate/Good
Headache Frequency	Discrete Quantitative	Ratio	Independent	Number per month
Headache Duration	Discrete Quantitative	Ratio	Independent	Days
Headache Severity	Quantitative	Ratio	Independent	Score
Sleep Duration	Discrete Quantitative	Ratio	Dependent	Hours
Aura	Quantitative	Nominal	Independent	Yes/No

3. Results

In this study, 200 individuals suffering from migraine who visited the polyclinic of Omid Hospital and Ayatollah Rouhani Hospital in Babol were evaluated for disability caused by migraine, sleep quality, and pain scale.

The average age of the patients was 32 years, with a standard deviation of 12.8 years and a range of 16 to 54 years. The average duration of migraine in these patients was 8.55 years with a standard deviation of 7.53 years, ranging from a minimum of 1 month to a maximum of 33 years.

The average pain intensity in these patients, based on the Visual Analog Scale (VAS), was 6.49 with a standard deviation of 2.24, with a minimum pain score of 1 and a maximum of 9. In the conducted analyses, the mean total score of the Pittsburgh Sleep Quality Index (PSQI) was used to compare the study groups.

Table 2. presents the frequency and percentage distribution of the demographic characteristics of the 200 patients studied.

	Variable	Frequency	Percentage
Gender	Female	127	63.5%
	Male	73	36.5%
Marital Status:	Single	51	25.5%
	Married	149	74.5%
Education Level	Primary	25	12.5%
	Secondary and Diploma	95	47.5%
	University	80	40.0%
Occupation	Free	58	29.0%
	Housewife	111	55.5%
	Employee	31	15.5%
Living Area	Rural	48	24.0%
	Urban	152	76.0%

Chart 1. Distribution of the Percentage of Aura Presence Among the 200 Migraine Patients Studied.

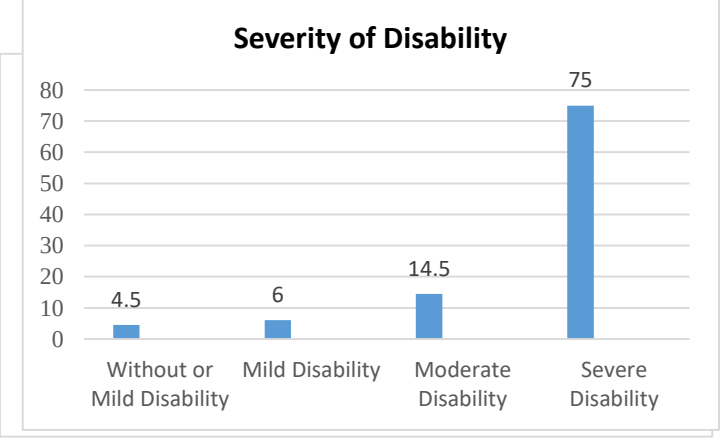

Chart 2. shows the percentage distribution of disability intensity caused by migraine among the 200 patients studied.

Table 3. Mean, Standard Deviation, Median, Minimum, and Maximum of Different Dimensions of Sleep Quality and Overall Sleep Quality

Subscale	Mean (SD)	Median	Minimum	Maximum
Mental Quality of Sleep	1.86 (0.93)	2	0	3
Delay in Falling Asleep	2.01 (0.92)	2	0	3
Duration of Sleep	2.26 (0.99)	3	0	3
Sleep Efficiency	1.53 (0.92)	1	0	3
Sleep Disturbances	1.54 (0.64)	2	0	3
Use of Sleep Medications	1.41 (1.01)	1	0	3
Daytime Dysfunction	1.85 (0.69)	2	0	3
Overall Sleep Quality	12.44 (2.91)	13	1	19

Among the 200 patients, 129 (64.5%) reported the presence of aura before the onset of migraine headaches, whereas 71 patients (35.5%) did not report the presence of aura (Chart 1).

In the assessment of disability caused by migraine, 9 patients (4.5%) had mild or no disability, 12 patients (6.0%) had mild disability, 29 patients (14.5%) had moderate disability, and 150 patients (75.0%) had severe disability.

In the explanations of the Sleep Quality Questionnaire, high scores indicate poor sleep quality. A total score greater than 5 indicates that the subject is a Poor Sleeper and has severe problems in at least 2 areas or moderate problems in more than 3 areas. In the review of the sleep quality subscales, the subscale for the use of sleep medications had the lowest average score, with a mean of 1.41. The duration of sleep subscale had the highest average score, with a mean of 2.26 (Table 3).

In the explanations of the VAS questionnaire, which indicates headache severity, based on the questionnaire mentioned in the Methods section, scores of 0 to 3 were considered normal, 4 to 7 moderate, and 8 to 9 severe. None of the patients reported a score of 10 based on the pain questionnaire.

The normality of the data distribution was assessed using the Kolmogorov-Smirnov test, and the results showed that all variables had a P value less than 0.05, indicating that the data did not follow a normal distribution. Therefore, the non-parametric Kruskal-Wallis test was used.

According to the results in Table 4, none of the sleep quality subscales had a significant relationship with different levels of headache severity. The duration of migraine occurrence was categorized based on the median, which was 7, into less than or equal to 7 years and more than 7 years.

Table 4. Comparison of Sleep Quality in Patients with Migraines

Sleep Quality/Headache Severity	Mild Mean ± (SD)	Moderate Mean ± (SD)	Severe Mean ± (SD)	P-Value
Mental Quality of Sleep	1.81 ± 0.81	1.81 ± 0.81	1.90 ± 0.99	0.66
Delay in Falling Asleep	1.71 ± 1.10	2.06 ± 0.88	2.03 ± 0.93	0.32
Duration of Sleep	2.33 ± 0.66	2.24 ± 1.04	2.25 ± 1.03	0.91
Sleep Efficiency	1.48 ± 0.93	1.67 ± 0.97	1.47 ± 0.89	0.35
Sleep Disturbances	1.76 ± 0.70	1.44 ± 0.62	1.54 ± 0.64	0.23
Use of Sleep Medications	1.48 ± 0.93	1.44 ± 1.01	1.38 ± 1.03	0.89
Daytime Dysfunction	1.81 ± 0.60	1.87 ± 0.73	1.84 ± 0.70	0.86
Overall Sleep Quality	12.38 ± 2.46	12.54 ± 3.07	12.40 ± 2.92	0.82

Table 5. Comparison of Sleep Quality and Its Dimensions with the Duration of Headache in Patients with Migraine

Sleep Quality/ Duration of Headache	Duration of Headache		P-Value
	Less than or equal to 7 years (Mean ± SD)	More than 8 years (Mean ± SD)	
Mental Quality of Sleep	*92.84±0.1*	*95.87±0.1*	*76.0*
Delay in Falling Asleep	*84.07±0.2*	*99.96±0.1*	*67.0*
Duration of Sleep	*97.25±0.2*	*03.25±1.2*	*72.0*
Sleep Efficiency	*89.46±0.1*	*94.60±0.1*	*27.0*
Sleep Disturbances	*65.52±0.1*	*63.54±0.1*	*71.0*
Use of Sleep Medications	*02.53±1.1*	*99.31±0.1*	*11.0*
Daytime Dysfunction	*69.82±0.1*	*70.88±0.1*	*52.0*
Overall Sleep Quality	*84.48±2.12*	*99.41±2.12*	*78.0*

The normal distribution of the data was assessed using the Kolmogorov-Smirnov test, and the results indicated that all variables had a P value less than 0.05, suggesting that the data do not follow a normal distribution. Therefore, the non-parametric Mann-Whitney test was used.

According to the results in Table 5, none of the sleep quality subscales showed a significant relationship with the duration of headache.

The normal distribution of the data was assessed using the Kolmogorov-Smirnov test, and the results indicated that all variables had a P value less than 0.05, suggesting that the data did not follow a normal distribution. Therefore, the non-parametric Mann-Whitney test was used.

According to the results in Table 6, all subscales of sleep quality, except for sleep disturbances, did not show a significant relationship with the presence or absence of aura.

The mean score of sleep disturbances in patients with migraine with aura was 1.73, which was higher than the mean score of 1.43 in patients without aura, and this difference was statistically significant (P=0.001). This indicates that sleep disturbances in patients with migraine with aura are significantly higher.

Table 6. Comparison of Sleep Quality in Patients with Migraine with and without Aura

Sleep Quality	With Aura Mean ± (SD)	Without Aura Mean ± (SD)	P-Value
Mental Quality of Sleep	*95.99±0.1*	*92.79±0.1*	*13.0*
Delay in Falling Asleep	*84.11±0.2*	*96.95±0.1*	*29.0*
Duration of Sleep	*94.23±0.2*	*03.27±1.2*	*39.0*
Sleep Efficiency	*92.59±0.1*	*92.50±0.1*	*52.0*
Sleep Disturbances	*65.73±0.1*	*61.43±0.1*	**001.0**
Use of Sleep Medications	*08.48±1.1*	*97.37±0.1*	*57.0*
Daytime Dysfunction	*70.82±0.1*	*69.86±0.1*	*73.0*
Overall Sleep Quality	*62.94±2.12*	*03.16±3.12*	*21.0*

Table 7. Comparison of Sleep Quality in Male Patients with Migraine with and without Aura

Sleep Quality	**With Aura Mean ± (SD)**	**Without Aura Mean ± (SD)**	**P-Value**
Mental Quality of Sleep	1.71 ± 1.07	1.50 ± 0.94	*368.0*
Delay in Falling Asleep	2.13 ± *0.92*	1.95 ± 0.93	*393.0*
Duration of Sleep	2.39 ± *0.71*	2.40 ± 0.91	*481.0*
Sleep Efficiency	1.39 ± *0.84*	1.28 ± 0.89	*594.0*
Sleep Disturbances	1.71 ± 0.59	1.21 ± 0.56	**001.0**
Use of Sleep Medications	1.26 ± 1.00	1.43 ± 0.89	*382.0*
Daytime Dysfunction	1.81 ± 0.60	1.85 ± 0.65	*760.0*
Overall Sleep Quality	12.39 ± 2.52	11.64 ± 2.97	*236.0*

According to the results in Table 7, all subscales of sleep quality, except for sleep disturbances, did not show a significant relationship with the presence or absence of aura in males.

The mean score of sleep disturbances in male patients with migraine with aura was 1.71, which was higher than the mean score of 1.21 in male patients without aura, and this difference was statistically significant (P=0.001). This indicates that sleep disturbances in male patients with migraine with aura are significantly higher.

According to the results in Table 8, all subscales of sleep quality did not show a significant relationship with the presence or absence of aura in females.

The mean score of mental quality of sleep-in female patients with migraine was 2.02, and the mean score in male patients with migraine was 1.59, indicating that mental quality of sleep-in females was significantly poorer (P=0.003).

The mean score of sleep efficiency in female patients with migraine was 1.65, and the mean score in male patients with migraine was 1.33, indicating that sleep efficiency in females was significantly poorer (P=0.01).

The mean score of sleep disturbances in female patients with migraine was 1.60, and the mean score in male patients with migraine was 1.42, indicating that sleep disturbances in females were significantly more (P=0.03).

Additionally, the mean overall sleep quality score in female patients with migraine was higher than in male patients, indicating that overall sleep quality in females was poorer, and this difference was statistically significant (P=0.02).

In other aspects, there were no statistically significant differences between men and women in the sleep quality subscales (Table 7).

The patients' ages were categorized based on the median age, which was 32, into groups of less than or equal to 32 years and more than 32 years.

Table 8. Comparison of Sleep Quality in Female Patients with Migraine with and without Aura

Sleep Quality	**With Aura Mean ± (SD)**	**Without Aura Mean ± (SD)**	**P-Value**
Mental Quality of Sleep	2.20 ± 0.79	1.93 ± 0.89	*114.0*
Delay in Falling Asleep	2.10 ± 0.78	1.94 ± 0.98	*562.0*
Duration of Sleep	2.10 ± 1.08		*484.0*

Sleep Quality	**With Aura Mean ± (SD)**	**Without Aura Mean ± (SD)**	**P-Value**
		2.21 ± 1.08	
Sleep Efficiency	1.75 ± 0.95	1.60 ± 0.92	*397.0*
Sleep Disturbances	1.75 ± 0.71	1.53 ± 0.61	060.0
Use of Sleep Medications	1.65 ± 1.12	1.34 ± 1.01	*152.0*
Daytime Dysfunction	13.37 ± 2.64	1.86 ± 0.72	*873.0*
Overall Sleep Quality	13.37 ± 2.64	12.41 ± 3.05	*292.0*

Table 9. Comparison of Sleep Quality in Patients with Migraine Based on Gender Sleep Quality Gender Female (Mean ± SD)

Sleep Quality/Gender	**Female Mean ± (SD)**	**Male Mean ± (SD)**	**P-Value**
Mental Quality of Sleep	2.02 ± 0.86	1.54 ± 0.99	***003.0***
Delay in Falling Asleep	1.99 ± 0.92	2.03 ± 0.93	*81.0*
Duration of Sleep	2.17 ± 1.08	2.40 ± 0.83	*31.0*
Sleep Efficiency	1.65 ± 0.93	1.33 ± 0.87	***01.0***
Sleep Disturbances	1.60 ± 0.65	1.42 ± 0.62	03.0
Use of Sleep Medications	1.44 ± 1.05	1.36 ± 0.93	*59.0*
Daytime Dysfunction	1.85 ± 0.73	1.84 ± 0.62	*76.0*
Overall Sleep Quality	12.72 ± 2.95	11.96 ± 2.80	***02.0***

According to the results in Table 11, none of the sleep quality subscales showed a significant relationship with different levels of disability due to migraine.

Table 10. Comparison of Sleep Quality in Patients with Migraine Based on Age

Sleep Quality/Age	**≤ 32 Mean ± (SD)**	**> 32 Mean ± (SD)**	**P-Value**
Mental Quality of Sleep	1.85 ± 0.97	1.87 ± 0.90	*94.0*
Delay in Falling Asleep	2.05 ± 0.94	1.96 ± 0.90	*39.0*
Duration of Sleep	2.17 ± 1.0	2.35 ± 0.99	*12.0*
Sleep Efficiency	1.42 ± 0.90	1.65 ± 0.93	*09.0*
Sleep Disturbances	1.41 ± 0.63	1.67 ± 0.63	**001.0**
Use of Sleep Medications	1.30 ± 0.94	1.54 ± 1.07	*08.0*
Daytime Dysfunction	1.95 ± 0.73	1.73 ± 0.64	***02.0***

Sleep Quality/Age	**≤ 32 Mean ± (SD)**	**> 32 Mean ± (SD)**	**P-Value**
Overall Sleep Quality	12.14 ± 3.07	12.77 ± 2.70	*12.0*

Table 11. Comparison of Different Dimensions of Sleep Quality in Different Levels of Disability Due to Migraine

Sleep Quality/ Level of Disability	**None to Minimal Mean ± (SD)**	**Mild Mean ± (SD)**	**Moderate Mean ± (SD)**	**Severe Mean ± (SD)**	**P-Value**
Mental Quality of Sleep	1.67 ± 1.32	1.58 ± 1.08	1.76 ± 0.95	1.91 ± 0.90	*62.0*
Delay in Falling Asleep	2.11 ± 1.05	1.83 ± 1.11	2.00 ± 0.84	2.01 ± 0.92	*92.0*
Duration of Sleep	2.67 ± 0.71	2.17 ± 0.94	2.10 ± 1.11	2.27 ± 1.0	*42.0*
Sleep Efficiency	1.67 ± 0.87	1.33 ± 0.98	1.38 ± 0.90	1.57 ± 0.92	*64.0*
Sleep Disturbances	1.44 ± 0.53	1.42 ± 0.67	1.38 ± 0.68	1.58 ± 0.64	30.0
Use of Sleep Medications	0.89 ± 0.93	1.08 ± 1.08	1.38 ± 0.94	1.47 ± 1.01	19.0
Daytime Dysfunction	1.89 ± 0.60	1.58 ± 0.99	1.76 ± 0.69	1.88 ± 0.67	59.0
Overall Sleep Quality	12.33 ± 3.28	11.04 ± 4.67	11.76 ± 2.89	12.69 ± 2.69	36.0

4. Discussion

The study's findings indicate no extensive correlation between headache intensity or migraine severity and sleep quality. This is consistent with the study by Song et al., which also found no significant relationship between headache intensity and sleep quality using the Visual Analog Scale (VAS) [36]. However, Song et al. did observe that individuals with poor sleep quality experienced more frequent headaches per month compared to those with good sleep quality, a result also reported by Lin et al [37]. In contrast, Karthik et al. found no significant relationship between overall sleep quality, daytime sleepiness, and MIDAS scores in patients with migraines without aura [38]. This discrepancy might be due to our study's absence of headache diaries, leading to inaccurate data on headache frequency and intensity.

Cho et al. found that poor sleep quality in migraine patients impacts headache intensity and frequency directly and indirectly, which contrasts with our results [39]. Poor sleep quality may alter the neuroendocrine stress response system and metabolic activity during sleep, impairing daily functioning. Cho et al. suggested that sleep quality impacts headache-related effects by affecting psychological and cognitive functions, further exacerbating headache-related impacts [40].

Headache-related impacts are typically influenced by pain intensity and attack frequency [41]. However, other factors, such as sleep quality, also contribute significantly to headache-related impacts. Primary headaches are associated with a higher prevalence of sleep issues, including poor sleep quality, short sleep duration, and insomnia [42]. Recent studies suggest that sleep deprivation

increases brain irritability, heightening sensitivity to migraine attacks [43,44]. Sleep deprivation also alters cortical inhibition and facilitation balance, potentially increasing cortical excitability [45]. Poor sleep quality may relate to cortical sensitivity [46]. A clinical study linked sleep duration with allodynia in migraine patients, though the mechanism by which sleep modulates cortical activities remains unclear [47]. Preclinical studies indicate that concentrations of key molecules in trigeminal vascular activation change with sleep cycles. The orexinergic neural pathway might also play a role in both sleep and migraines, potentially linking these conditions [48].

Therefore, the outcomes suggest that migraine patients generally have poor sleep quality, with significant issues in sleep onset latency and sleep duration, as revealed by the Pittsburgh Sleep Quality Index (PSQI) questionnaire [49]. Various studies have shown similar findings. A meta-analysis by Stanyer et al. indicated that adults with migraines have higher PSQI scores, reflecting poor subjective sleep quality. Cho et al. found poor overall sleep quality in migraine patients, with issues in sleep onset latency, though other sleep domains had mean scores below 2 [39]. Song et al reported that migraine patients had higher PSQI scores compared to controls, indicating sleep disorders [36]. Kim et al. found that sleep disorders were positively associated with migraine diagnosis [50]. Studies in Iran, such as those by Sadati et al. and Asadnia et al., found significant correlations between overall sleep quality and migraines, though not with sleep duration [51,52]. Jalalian et al. and Rafique et al. found significant relationships between poor sleep quality and migraines, though Rafique noted no significant difference in PSQI scores compared to controls [53].

A potential mechanism for poor sleep quality in migraine patients might involve REM sleep, which is reduced in adults with migraines compared to healthy individuals [49]. Reduced REM sleep has been observed before migraine attacks [54]. Cutaneous allodynia, a prominent migraine symptom, worsens with REM sleep deprivation, suggesting a disruption in sleep transitions [55]. The orexinergic system of the hypothalamus, stabilizing sleep/wake transitions and REM sleep, is also associated with migraines, indicating commonalities between sleep and trigeminal headaches [56]. In addition, women have poorer sleep quality than men, particularly in subjective sleep quality, sleep efficiency, and sleep disturbances [57]. This aligns with studies by Landis et al. and Zhang et al., who reported poorer sleep quality in women [58]. Fatima et al. found that poor sleep quality in women is more prevalent, independent of depression, socio-economic factors, and lifestyle, potentially due to biological differences [59]. In contrast, Kim et al. found that men are at higher risk for sleep disorders associated with migraines, attributed to lower healthcare-seeking behavior [50]. Asadnia et al. found no differences in sleep quality between male and female patients, contrasting with our findings [52].

There is no significant relationship between age and sleep quality in migraine patients. However, individuals older than

32 had significantly poorer sleep disturbances, and those younger than 32 had poorer daily performance [36]. Song et al. reported no significant age differences in sleep quality. Kim et al. found that sleep disorder prevalence increases with age in migraine patients, unlike our study [50]. The lack of a relationship between sleep quality and age could be due to our study population's average age of 32 years, falling within middle age, with the oldest being 54 years. Studies indicate poorer sleep quality in individuals over 60, not align with our study population. Cultural background also significantly impacts napping habits [60]. Younger individuals may stay awake more due to lifestyle factors, explaining higher daytime sleepiness scores in this group. Aging is associated with reduced sleep maintenance ability, stabilizing after age 60, indicating that increased sleep disturbance scores in those over 32 are logical [61]. Besides, it lacks an immense connection between overall sleep quality and the presence or absence of aura. However, individuals with aura had higher sleep disturbance scores [62]. No significant difference in overall sleep scores was found between men and women with and without aura, except men with aura had higher sleep disturbance scores. Karthik et al. found significant differences in overall sleep quality in individuals with migraines without aura compared to controls [38].

Overall, while sleep quality issues are prevalent among migraine patients, the study found no significant correlation between sleep quality and headache intensity or migraine severity. Various factors, including age, gender, and the presence of aura, influence sleep quality, highlighting the complex interplay between sleep and migraines.

4.1. Recommendations for Future Research

- Conduct a similar study with objective sleep assessments in migraine patients.
- Perform a prospective study to examine the effect of treating sleep disorders on headache intensity and migraine severity in migraine patients.
- Conduct a study post-COVID-19 pandemic in-person condition.

5. Conclusion

The present study's findings indicate that migraine patients generally exhibit poor sleep quality, particularly in the domains of sleep onset latency and sleep duration. This poor sleep quality is more pronounced in women. Notably, no significant correlation was observed between migraine severity, headache intensity, and the presence of aura with sleep quality. Furthermore, there was no difference in sleep quality between men and women with or without aura.

Migraines are highly prevalent and constitute the second leading cause of disability worldwide. Consequently, identifying migraine-related complications is crucial for enhancing the quality of life in affected patients. Our findings align with most previous studies, indicating that individuals with migraines suffer from poor sleep quality. However, no significant correlation was found between pain intensity or migraine severity and sleep quality. These results suggest that sleep quality assessments should be routinely conducted in all individuals with migraines, irrespective of

pain intensity and migraine severity, to facilitate appropriate therapeutic interventions. However, a primary limitation of this study is the subjective nature of the questionnaires employed, which may increase the likelihood of errors in the findings. Future research should consider utilizing objective measures to assess sleep quality more accurately.

References

[1] Fallahzade H, Alihaydari A, A., Hoseini H. Prevalence of Migraine and Tension Headache in Students of Guidance Schools in Yazd City, 2008. Razi Journal of Medical Sciences. 2010;17(76):52-61.

[2] Olesen JT, Peer H, Welsh K, Micheal A. The Headache. 6th ed. Lippincott Williams & Wilking, Philadelphia. 2018; PP: 1024-52.

[3] Morillo LE, Alarcon F, Aranaga N, Aulet S, Chapman E, Conterno L, et al. Prevalence of migraine in Latin America. Headache. 2005;45(2):106-17.

[4] Adams RD, Victor M. Headache and other craniofacial pains. In principles of neurology. 1985;(7) 129-48.

[5] Evans R, Mathew N. Handbook of Headache. Lipincotte Williams & Wilkins, Philadelphia. 2000; (6): 339- 50.

[6] Victor M, Allan HR, Adams and Victor S. Principles of Neurology. 11th ed. Philadelphia McGraw-Hill. 2019 (4):182-1899.

[7] Olesen J, Hanesn P, Welch K. The Headaches. 8th ed. Philadelphia Lippincott Williams and Wilkins. 2020; (2);23- 42.

[8] Dalouchi F, Moradi F, Modarres Mousavi M, Karimzadeh F. A Review on the Structural and Metabolic Biomarkers in Migraine. The Neuroscience Journal of Shefaye Khatam. 2019;7(1):63-76.

[9] Azizi M, Aghamohammadian Sharbaf HR, Mashhadi A, Asgari Ebrahimabad MJ. A Meta-Analysis of Psychological Factors of Migraines in Iran. Health Psychology. 2017;6(22):88-100.

[10] Olesen J. The International Classification of Headache Disorders, 2nd edition: application to practice. Funct Neurol. 2005;20(2):61-8.

[11] Sadeghi O, Nasiri M, Allahyari Bayatiyani F, Rasad H, Pahlavani N, Maghsoudi Z, et al. Migraine and Magnesium: Review of Evidences. Clinical Excellence. 2015;3(2):15-27.

[12] Kowa H, Yasui K, Takeshima T, Urakami K, Sakai F, Nakashima K. The homozygous C677T mutation in the methylenetetrahydrofolate reductase gene is a genetic risk factor for migraine. Am J Med Genet. 2000;96(6):762-4.

[13] Oterino A, Toriello M, Valle N, Castillo J, Alonso-Arranz A, Bravo Y, et al. The relationship between homocysteine and genes of folate-related enzymes in migraine patients. Headache. 2010;50(1):99-168.

[14] Mottaghi T, Khorvash F, Askari G, Maracy MR, Ghiasvand R, Maghsoudi Z, et al. The relationship between serum levels of vitamin D and migraine. J Res Med Sci. 2013;18(Suppl 1): S66-70.

[15] Breslau N, Rasmussen BK. The impact of migraine: Epidemiology, risk factors, and co-morbidities. Neurology. 2001;56 (6 Suppl 1): S4-12.

[16] Piane M, Lulli P, Farinelli I, Simeoni S, De Filippis S, Patacchioli FR, et al. Genetics of migraine and pharmacogenomics: some considerations. J Headache Pain. 2007;8(6):334-9.

[17] Schurks M. Genetics of migraine in the age of genome-wide association studies. J Headache Pain. 2012;13(1):1-9.

[18] Breslau N, Davis GC. Migraine, physical health, and psychiatric disorder: a prospective epidemiologic study in young adults. Journal of psychiatric research. 1993;27(2):211-21.

[19] Minen MT, Begasse De Dhaem O, Kroon Van Diest A, Powers S, Schwedt TJ, Lipton R, et al. Migraine and its psychiatric comorbidities. Journal of neurology, neurosurgery, and psychiatry. 2016;87(7):741-9.

[20] MacGregor EA. Migraine. Ann Intern Med. 2017;166(7): ITC49-ITC64.

[21] Bigal ME, Lipton RB. Obesity is a risk factor for transformed migraine but not chronic tension-type headaches. Neurology. 2006;67(2):252-257

[22] May A, Schulte LH. Chronic migraine: risk factors, mechanisms, and treatment. Nat Rev Neurol. 2016;12(8):455-464.

[23] Condello C, Piano V, Dadam D, Pinessi L, Lantéri-Minet M. Pain beliefs and perceptions inventory: a cross-sectional study in chronic and episodic migraine. Headache. 2015;55(1):136-148.

[24] De Tommaso M, Sardaro M, Vecchio E, Serpino C, Stasi M, Ranieri M. Central sensitization phenomena in primary headaches: overview of a preventive therapeutic approach. CNS Neurol Disord Drug Targets. 2008;7(6):524-535.

[25] Amin FM, Asghar MS, Hougaard A, et al. Magnetic resonance angiography of intracranial and extracranial arteries in patients with spontaneous migraine without aura: a cross-sectional study. Lancet Neurol. 2013;12(5):454-461.

[26] Noseda R, Burstein R. Migraine pathophysiology: anatomy of the trigeminovascular pathway and associated neurological symptoms, cortical spreading depression, sensitization, and modulation of pain. Pain. 2013;154(suppl 1): S44-S53.

[27] Amin FM, Hougaard A, Schytz HW, et al. Investigation of the pathophysiological mechanisms of migraine attacks induced by pituitary adenylate cyclase-activating polypeptide-38. Brain 2014; 137: 779–94.

[28] available from https://ichd-3.org/1-migraine/ (2021).

[29] Boland RJ, Kaplan and Sadock's Synopsis of Psychiatry. 12th ed, Wolters Kluwer,2022.

[30] Fiorentino L, Ancoli-Israel S. Insomnia and its treatment in women with breast cancer. Sleep Medicine Reviews 2006; 10:419-29.

[31] Taylor D, Lichstein K, Durrence H. Insomnia as a health risk factor. Behave Sleep Med. 2003;1(4):227-47.

[32] Hayes R, Martin S, Sesti A, Spitzer K. Psychometric properties of the medical outcomes study sleep measure. Sleep Med. 2005;6: 41-4.

[33] Evans F. Subjective characteristics of sleep efficiency. J Abnorm Psychol 1977;86: 561-4.

[34] Zandifar A, Asgari F, Haghdoost F, Masjedi SS, Manouchehri N, Banihashemi M, Ghorbani A, Najafi MR, Saadatnia M, Lipton RB. Reliability and validity of the migraine disability assessment scale among migraine and tension type headache in Iranian patients. BioMed research international. 2014.16;2014.

[35] Hasanzadeh M, Alavi KNK, Ghalehbandi M, YAD EZ, GHARAEI B, Sadeghikia A. Sleep quality in Iranian drivers recognized as responsible for severe road accidents. 2008.

[36] Song TJ, Cho SJ, Kim WJ, Yang KI, Yun CH, Chu MK. Poor sleep quality in migraine and probable migraine: a population study. J Headache Pain. 2018;19(1):58.

[37] Lin YK, Lin GY, Lee JT, Lee MS, Tsai CK, Hsu YW, Lin YZ, Tsai YC, Yang FC. Associations between sleep quality and migraine frequency: a cross-sectional case-control study. Medicine. 2016;95(17).

[38] Karthik N, Kulkarni GB, Taly AB, Rao S, Sinha S. Sleep disturbances in 'migraine without aura'—A questionnaire-based study. Journal of the Neurological Sciences. 2012 Oct 15;321(1-2):73-6.

[39] Cho S, Lee MJ, Park HR, Kim S, Joo EY, Chung CS. Effect of Sleep Quality on

Headache-Related Impact in Primary Headache Disorders. Journal of Clinical Neurology (Seoul, Korea). 2020;16(2):237-44.

[40] Tiemeier H, Pelzer E, Jönck L, Möller HJ, Rao ML. Plasma catecholamines and selective slow-wave sleep deprivation. Neuropsychobiology 2002; 45:81-86

[41] Goder R, Fritzer G, Kapsokalyvas A, et al. Polysomnographic findings in nights preceding a migraine attack. Cephalalgia. 2001;21(1):31-37.

[42] Seidel S, Hartl T, Weber M, Matterey S, Paul A, Riederer F, Gharabaghi M, Wöber-Bingöl C, Wöber C, PAMINA Study Group. Quality of sleep, fatigue and daytime sleepiness in migraine—a-controlled study. Cephalalgia. 2009 Jun;29(6):662-9.

[43] Scalise A, Desiato MT, Gigli GL, Romigi A, Tombini M, Marciani MG, et al. Increasing cortical excitability: a possible explanation for the proconvulsant role of sleep deprivation. Sleep 2006; 29:1595-1598.

[44] Lang E, Kaltenhäuser M, Neundörfer B, Seidler S. Hyperexcitability of the primary somatosensory cortex in migraine--a magnetoencephalographic study. Brain 2004; 127:2459-2469.

[45] Noseda R, Kainz V, Jakubowski M, Gooley JJ, Saper CB, Digre K, et al. A neural mechanism for exacerbation of headache by light. Nat Neurosci 2010; 13:239-245.

[46] Smith MT, Edwards RR, McCann UD, Haythornthwaite JA. The effects of sleep deprivation on pain inhibition and spontaneous pain in women. Sleep 2007; 30:494-505.

[47] de Tommaso M, Delussi M, Vecchio E, Sciruicchio V, Invitto S, Livrea P. Sleep features and central sensitization symptoms in primary headache patients. J Headache Pain 2014; 15:64.

[48] Holland PR. Headache and sleep: shared pathophysiological mechanisms. Cephalalgia 2014; 34:725-744.

[49] Stanyer EC, Creeney H, Nesbitt AD, Holland PR, Hoffmann J. Subjective Sleep Quality and Sleep Architecture in Patients with Migraine: A Meta-analysis. Neurology. 2021.19;97(16): e1620-31.

[50] Kim SJ, Han KT, Jang SY, Yoo KB, Kim SJ. The Association between Migraine and Types of Sleep Disorder. International journal of environmental research and public health. 2018;15(12).

[51] Sadati L, Bakhteyar K, Saadatmand M, Saadatmand S, Asadnia S. The Relationship between Sleep Quality and Academic Achievement with Migraine Headaches among Alborz Medical Sciences University Students. scientific magazine yafte. 2017;18(4):59-69.

[52] Asadnia S, Sepehrian Azar F, Saadatmand S, Mosarrezaii Aghdam A. The Relationship between Sleep Qualities with Migraine Headaches among Urmia University Students. Studies in Medical Sciences. 2013;24(4):286-94.

[53] Jalilian R, Ghajarzadeh M, Fateh R, Togha M, Sahraian MA, Azimi A. Comparison of sleep quality in women with migraine moreover, multiple sclerosis. Acta Medica Iranica. 2014:690-3.

[54] Goder R, Fritzer G, Kapsokalyvas A, et al. Polysomnographic findings in nights preceding a migraine attack. Cephalalgia. 2001;21(1):31-37.

[55] Kim SH, Park JY, Shin HE, et al. The influence of rapid eye movement sleep deprivation on nociceptive transmission and the duration of facial allodynia in rats: a behavioral and Fos immunohistochemical study. J Headache Pain. 2019; 20(1):21.

[56] Feng H, Wen SY, Qiao QC, et al. Orexin signaling modulates synchronized excitation in the sublaterodorsal tegmental

nucleus to stabilize REM sleep. Nat Commun. 2020; 11(1):3661.

[57] Landis CA, Lentz MJ.Editorial: News alert for mothers: Having children at home doesn't increase your risk for severe daytime sleepiness and fatigue Sleep 2006; 29 (6): 738-40.

[58] Zhang B, Wing YK, Sex differences in insomnia: a meta-analysis. Sleep 2006; 29(1): 85-93.

[59] Fatima Y, Doi SA, Najman JM, Al Mamun A. Exploring gender difference in sleep quality of young adults: findings from a large population study. Clinical medicine & research. 2016.1;14(3-4):138-44.

[60] Li J, Vitiello MV, Gooneratne NS. Sleep in normal aging. Sleep medicine clinics. 2018.1;13(1):1-1.

[61] Jaussent I, Morin CM, Ivers H, Dauvilliers Y. Incidence, worsening and risk factors of daytime sleepiness in a population-based 5-year longitudinal study. Scientific reports. 2017.2;7(1):1-1.

[62] Ohayon MM, Carskadon MA, Guilleminault C, Vitiello MV. Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: developing normative sleep value.