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The Relationship Between Psychosocial and Behavioral Factors and Fatigue in Migraine Patients

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ABSTRACT

Purpose: Migraine is a neurological disorder characterized by recurrent headaches often accompanied by fatigue. Fatigue is one of the most disabling symptoms experienced by migraine patients, yet it remains underexplored. This study examined the relationship between fatigue and psychosocial and behavioral factors in migraine patients.
Method: This cross-sectional study included patients aged 18–55 years who were diagnosed with migraine. The Migraine Disability Assessment Questionnaire (MIDAS) was used to assess migraine-related disability, and the Modified Fatigue Impact Scale (MFIS) was used to assess fatigue. Psychosocial factors were evaluated using the Beck Depression Inventory (BDI) for depressive mood, the Pain Catastrophizing Scale (PCS) for pain-related catastrophizing, and the General Self-Efficacy Scale (GSE) for self-efficacy. Behavioral factors were assessed using the Epworth Sleepiness Scale (ESS) and the Pittsburgh Sleep Quality Index (PSQI) for sleep patterns, the Motivation for Healthy Eating Scale (MHES) for nutritional attitude, and the 36-Item Self-Reported Physical Activity Behavior (SPAB) questionnaire for physical activity levels.
Results: There were moderate correlations between fatigue (MFIS) and depressive mood, pain catastrophizing, self-efficacy, and sleep quality ($\rho = 0.318$, 0.371, 0.371, and 0.403, respectively).
Conclusion: Fatigue in migraine patients appears to be closely associated with psychosocial and behavioral factors, emphasizing the importance of a holistic, biopsychosocial approach in clinical management. Fatigue in migraine patients is related to psychosocial and behavioral factors, including depressive mood, pain catastrophizing, self-efficacy, and sleep quality, all of which should be evaluated for appropriate management.
Key Words: Migraine, fatigue, biopsychosocial, psychosocial factors, behavioral factors

INTRODUCTION

Migraine is a primary headache disorder, typically unilateral, characterized by recurrent attacks lasting 4–72 hours, and these attacks may be aggravated by routine physical activities such as climbing stairs or brisk walking (1, 2). Its clinical presentation is quite heterogeneous and may persist throughout life (3). Proposed physiological mechanisms linking migraine and fatigue include disturbances in energy metabolism and mitochondrial function, neuroinflammatory processes and dysregulation of central arousal systems (4). Owing to its high prevalence and disabling nature, migraine imposes a substantial socioeconomic burden (2,5). Therefore, the World Health Organization (WHO) recognizes migraine as a high-priority public health problem (6).

Fatigue is characterized by difficulties in initiating or sustaining voluntary activities and it is influenced by a variety of factors, including sleep, arousal, systemic health, and mood (7, 8). It affects 60–80% of patients with migraine (9). Gowers (1899) was the first to note that migraine includes marked fatigue and lethargy (9). However, it remains unclear whether fatigue is merely a symptom of migraine or whether chronic fatigue syndrome is a comorbid disorder associated with migraine (10). Fatigue has both direct and indirect detrimental effects, as it impairs activities of daily living and overall quality of life (11). It has been reported that fatigue is highly likely to affect the social well-being of migraine patients; unfortunately, fatigue in migraine patients has received limited research attention (12, 13).

These individuals may also be more vulnerable to behavioral and psychosocial risk factors that contribute to fatigue in this population. Modifying such factors offers important opportunities to reduce adverse outcomes. It has also been reported that comprehensive public health challenges cannot be adequately addressed without considering psychosocial and behavioral effects (13, 14). Given the high prevalence of fatigue in migraine patients and the significant socio-economic burden it imposes, it is essential to assess fatigue and related factors (15, 16).

Given the high prevalence and multifactorial nature of fatigue in migraine, this study aimed to investigate the associations between fatigue and psychosocial (depressive mood, self-efficacy, and pain catastrophizing) as well as behavioral (sleep quality, daytime sleepiness, physical activity, and healthy eating attitudes) factors in migraine patients. By integrating both psychological and behavioral dimensions, this study seeks to contribute novel insights into the biopsychosocial mechanisms underlying migraine-related fatigue. It was hypothesized that psychosocial and behavioral factors would be significantly associated with fatigue levels in individuals with migraine.

METHODS

Study Design

This cross-sectional observational study was conducted at the Neurology Outpatient Clinic of Erzincan Binali Yıldırım University, between December 2021 and March 2022, in Turkey. Ethical approval was obtained from the local ethical committee (Approve number: GO21/301-/2021-05). All procedures were carried out in accordance with the Declaration of Helsinki.

Participants

Individuals were informed about the study plan, and those who agreed to participate signed an informed consent form that detailed the study's purpose and methods. The inclusion criteria were: (1) being diagnosed with migraine by a neurologist according to the International Classification of Headache Disorders (ICHD-3) (16), (2) aged between 18 and 55 years, (3) having at least 5 years of education, and (4) scoring >24 on the Mini-Mental State Examination (MMSE). The age range of 18–55 years was chosen to ensure cognitive and psychological stability, minimize the potential influence of age-related comorbidities, and maintain homogeneity in psychosocial characteristics. This range has also been commonly adopted in previous studies examining psychosocial and behavioral factors in migraine populations. The exclusion criteria were: (1) having any neurological, orthopedic, or systemic disease that could cause fatigue, (2) having a diagnosed psychiatric disorder, (3) having a concomitant type of headache other than migraine (e.g., tension-type headache), and (4) being pregnant or lactating. A total of 61 participants who met the inclusion criteria were enrolled in the study. Of the 61 participants, 10 (16.3%) had chronic migraine and 51 (83.6%) had episodic migraine.

Assessments

Participants were interviewed once, and all evaluations were completed within approximately 60–65 minutes. They were instructed to maintain their usual daily routines (e.g., sleep, diet) and to avoid intense physical activity in the 24 hours preceding the assessment.

Socio-demographic and migraine characteristic: Socio-demographic characteristics of the individuals such as age, height, and weight were recorded. The Migraine Disability Assessment Scale (MIDAS) was used to determine the disability level and the severity of migraine symptoms (MIDAS). It covers the previous 3 months and contains five disability-related items. In three domains (school/paid work, household work, family, social or leisure activities), the patient rates the number of days missed due to headache. The total score received from these questions is used to classify disability based on the number of days missed from these activities and the severity of the attacks. The two additional questions (A and B) are not scored but provide clinical information. MIDAS A evaluates headache frequency and MIDAS B evaluates pain intensity (0 = no pain; 10 = very severe pain) over a three-month period (17, 18).

Fatigue assessment: Fatigue was assessed using the Modified Fatigue Impact Scale (MFIS). It is a multidimensional, 21-item questionnaire that assesses the effects of fatigue in the physical (9 items), psychosocial (2 items), and cognitive (10 items) domains over the past 4 weeks. Participants rate the 21 items on a 5-point Likert-type scale as “never (0)” to “always (4)”. The MFIS yields three subscale scores and an overall score ranging from 0 to 84. Overall MFIS scores of 38 or higher indicate fatigue (19).

Psychosocial Factors: Three instruments were used to evaluate psychosocial variables. Beck Depression Inventory (BDI), Pain Catastrophizing Scale (PCS), General Self-Efficacy Scale (GSE). The BDI consists of 21 items, each with 4 response options scored 0-3. The maximum score is 63, and the cut-off point is 17 (20).

PCS assesses patient's thoughts, and feelings about pain. It is a self-report scale with 13 items and 3 subscales. A 5-point scale is used for each item, with higher values representing greater catastrophe. Scores of each item in each subscale are summed to determine the subscale scores and the total score is calculated with the sum of all items. PCS score range from 0 to 52 points (21).

General Self-Efficacy Scale (GSE) is a 5-point Likert- scale questionnaire. Participants respond to the question "How well does it describe you?" with the answers ranging from "never" to "very well." Items 2, 4, 5, 6, 7, 10, 11, 12, 14, 16, and 17 of the scale are reverse scored. Total score ranges from 17 to 85, with higher scores indicating higher self-efficacy beliefs (22).

Behavioral Factors: Sleep, eating, and physical activity behaviors were assessed. ESS consists of 8 items, each of which asks about the subject's likelihood of falling asleep in general or in a specific situation encountered in daily life. The ESS score is the total of all 8 items' scores, and ranges from 0 to 24 (23). Higher scores indicate higher subjective sleepiness (1, 23).

PSQI has 24 items and with scores ranging from 0 to 3. The scale has 7 components, namely, subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleeping pills, and daytime dysfunction. The total score ranges from 0 to 21, and a score of 5 or above indicates significantly poor sleep quality (24, 25).

MHES assess the eating attitudes. It is assumed that 21 points indicate a very low attitude towards healthy eating, 23-42 points indicate a low attitude, 43-63 points indicate a medium attitude, 64-84 points indicate a high attitude, and 85-105 points indicate ideally high attitude (26).

SPAB was created by Cathrine Jacson (1999) based on the Theory of Planned Behavior, with additional variables added. Assessments are made on a scale from 1 to 7, with higher scores indicating higher levels of physical activity. The application time of the scale averages 15-20 minutes (27).

Statistical Analysis

Statistical analysis of the data was performed using SPSS Statistics version 27 (IBM Corp., Armonk, NY, USA). Data are expressed as percentages and numbers for qualitative variables, and as mean ± standard deviations or median (interquartile range) for quantitative variables. Normality was assessed using the Kolmogorov–Smirnov test. Spearman's rank-order correlation test (rho), test was used for non-normally distributed data. Correlation strengths are classified as poor: rho < 0.3; fair: rho = 0.3–0.5; moderate: rho = 0.6–0.7; and very strong: rho = 0.8–0.9. A p-value < 0.05 was considered statistically significant (28, 29).

RESULTS

Out of the ninety-three (93) migraine patients, sixty-one (61) were able to participate in the study because twenty-six (26) migraine patients did not meet the inclusion criteria and 6 did not show up for the evaluation.

Socio-demographic and migraine characteristics: The socio-demographic and migraine characteristics of the 61 volunteer participants are summarized in Table 1.

Fatigue Results: MFIS total result was 57.23±14.04; cognitive sub-parameter mean of the MFIS was 16.97±4.79; the mean of the social sub-parameter of MFIS was 29.92±7.41; and, the mean of physical sub-parameter of MFIS was determined as 10.31±3.11.

The Relationship Between Fatigue and Migraine Characteristic: The MFIS total score had a fairly significant correlation with the MIDAS and the MIDAS-Pain Frequency, however poor correlation with MIDAS-VAS (rho=0.321, rho=0.358, rho=0.229, respectively) (Table 2).

Table 1. Socio-Demographic characteristics

Variables		X±SD or n (%)
Gender	Female	54 (88.5)
	Male	7 (11.5)
Age		36.43±9.19
BMI (Kg/M²)		25.34±4.83
Migraine Type	Chronic	18
	Episodic	43
Aura Presence	Yes	7
	No	54
Presence Of White Ore Lesion	Chronic	10
	Episodic	51
Diagnosis Time (Years)		9.83±9.88 (1-39)
MIDAS		67.54±47.03 (3-130)
	1. Degree	2 (3.27)
	2. Degree	2 (3.27)
	3. Degree	5 (8.19)
	4. Degree	52 (85.24)
MIDAS-Pain Frequency		42.44±26.89 (9-80)
MIDAS-VAS		7.48±1.68 (3-10)

BMI: Body Mass Index, SD: Standard Deviation X: Mean N: Number of Participants MIDAS: Migraine Disability Rating Scale VAS: Visual Analog Scale

Relationship Between Fatigue and Psychosocial Factors: The mean scores were as follows: BDI 19.46±10.63, PCS 44.74±13.44, GSE 63.15±11.53.

Table 2. The relationship between fatigue and disease-related features

		MIDAS	MIDAS- Pain Frequency	MIDAS-VAS
MFIS - Total	Rho	0.321*	0.358**	0.229
	p	0.012	0.005	0.076
MFIS - Cognitive	Rho	0.276*	0.315*	0.153
	p	0.031	0.014	0.240
MFIS - Social	Rho	0.340*	0.421**	0.219
	p	0.007	0.001	0.089
MFIS - Physical	Rho	0.196	0.218	0.204
	p	0.130	0.092	0.115

* P<0.05 MFIS: Modified Fatigue Impact Scale MIDAS: Migraine Disability Rating Scale VAS: Visual Analogue Scale

Table 3. The relationship of fatigue with psychosocial factors

		BDI	PCS	GSE
MFIS - Total	Rho	0.318*	0.371**	-0.295*
	P	0.013	0.003	0.021
MFIS - Cognitive	Rho	0.368**	0.408**	-0.329*
	P	0.003	0.001	0.010
MFIS - Social	Rho	0.256*	0.337**	-0.241
	P	0.046	0.008	0.061
MFIS - Physical	Rho	0.170	0.133	-0.186
	P	0.190	0.306	0.152

* P<0.05 **MFIS:** Modified Fatigue Impact Scale **BDI:** Beck Depression Scale Scale **PCS:** Pain Catastrophizing Scale **GSE:** General Self-Efficacy Scale

There was a fairly significant correlation between BDI and MFIS-Total (rho=0.318) and MFIS-Cognitive (rho=0.368) and a poor correlation between BDI and MFIS-Social (rho=0.256). A fairly significant correlation was found between the PCS and the MFIS-Total (rho=0.371), the MFIS-Cognitive (rho=0.408), and the MFIS-Social (rho=0.337). While there was a negative fairly significant relationship between GSE and MFIS-Total (rho=-0.295) and MFIS-Cognitive (rho=-0.329) factors, a negative poor correlation was found between MFIS-Social (rho=-0.241) (Table 3).

The Relationship of Fatigue with Behavioral Factors: The mean values of behavioral factors were ESS 6.56±4.41, SPAB 158.13±30.93, MHES 73.61±11.65, and PSQI-Total 8.03±3.73.

No significant correlation was found with ESS, SPAB and MFIS- Total, Cognitive, Social, and Physical sub-parameters at any level. A fairly significant relationship was found with the PSQI and the MFIS-Total (rho=0.403), MFIS- Cognitive (rho=0.394), and MFIS-Social (rho=0.405) (Table 4).

Table 4. Relationship of fatigue with behavioral factors

		ESS	PSQI-Total	MHES	36SPAB
MFIS - Total	Rho	-0.134	0.403**	-0.048	0.120
	p	0.304	0.001	0.715	0.358
MFIS - Cognitive	Rho	-0.001	0.394**	-0.155	0.090
	p	0.993	0.002	0.232	0.491
MFIS-Social	Rho	-0.157	0.405**	-0.021	0.098
	p	0.228	0.001	0.873	0.455
MFIS - Physical	Rho	-0.158	0.264*	0.097	0.190
	p	0.224	0.040	0.457	0.142

*p<0.05 MFIS: Modified Fatigue Impact Scale ESS: Epworth Sleepiness Scale PSQI: Pittsburgh Sleep Quality Index 36SPAB 36-item Physical Activity

DISCUSSION

The focus of this research was to investigate the relationship between fatigue and psychosocial and behavioral variables in migraine patients. To the best of our knowledge, this is one of the few studies that simultaneously examined both psychosocial (depression, self-efficacy, pain catastrophizing) and behavioral (sleep quality, eating attitudes, and physical activity) variables associated with fatigue in this population. The most important finding is that fatigue was related to psychological factors including depressive mood, self-efficacy, and pain catastrophizing, as well as behavioral factors including sleep quality in migraine patients.

Our findings indicate that psychosocial and behavioral factors jointly contribute to fatigue in migraine, underscoring a multidimensional interaction that extends beyond traditional biomedical explanations. This integrated perspective highlights that both emotional-cognitive and lifestyle-related domains play complementary roles in fatigue manifestation. These results may provide valuable insights for designing rehabilitation and behavioral interventions targeting fatigue management in migraine. Biological pathways such as energy-metabolism disturbances and neuroinflammatory mechanisms may underlie both migraine and fatigue, and these processes can be modulated by sleep disruption and psychosocial stressors (4). Similar multidimensional frameworks have been supported in chronic pain and neurological conditions, emphasizing that psychological and behavioral regulation jointly shape fatigue perception (30). Previous studies have yielded inconsistent findings regarding the relationship between migraine and fatigue. Delva et al. reported a weak correlation between pain frequency and fatigue in migraine patients (12). Seidel et al. reported that migraine patients with high pain frequency had higher fatigue than those with low pain frequency or healthy controls (31). Our findings corroborate Seidel's findings, which indicated a significant relationship between fatigue and pain frequency. This may indicate that the cumulative burden of repeated attacks, rather than the severity of a single episode, contributes to fatigue.

The relationship between fatigue and depression has been well-documented across neurological and chronic pain conditions (32-34). It has been reported that there is a two-way relationship between fatigue and depression in migraine patients, and that one problem increasing the risk of the other (35, 36). Peres et al. reported a moderate relationship between fatigue and depression in chronic migraine patients. Additionally, a high level of correlation was found between mental fatigue and depression (10). In the study of Mercante et al., 85.8% of the migraine patients had at least some degree of depression (mild to severe). Patients with fatigue also reported significantly higher levels of depression than those without fatigue (37). Our findings are consistent with the literature by showing an association between fatigue and depressive mood. This finding suggests that, rather than approaching treatment prescriptions solely from a biological perspective, therapists should utilize a biopsychosocial approach in order to break the depressive mood and fatigue loop. These results support the value of a biopsychosocial perspective; however, implementation should be individualized, considering patient preferences and potential barriers to psychosocial interventions.

Pain catastrophizing is defined as an individual's overreaction to their pain (38). Severe headache increases fear of pain and avoidance behavior (39). Previous studies have reported that those who catastrophized their pain showed greater emotional distress and severe pain intensity than the chronic pain group.

It was found that migraine patients had a higher catastrophizing score than the healthy control group, even though they did not reach a clinically significant catastrophic level (39). The literature focuses on the relationship between catastrophe and pain intensity (38) but not on the correlation between fatigue and catastrophe in migraine patients. To the best of our knowledge, this is the first study to show a correlation between fatigue and pain catastrophe. We believe that a biopsychosocial approach that focuses on changing negative thoughts into positive thoughts will be successful in treating both pain and fatigue.

Severe and recurrent headaches limit activities of daily living, impair quality of life, and reduce productivity. Low quality of life and avoidance of personal activities have been shown to have an impact on an individual's emotional life and self-efficacy (40). In the literature, a negative relationship was found between self-efficacy and fatigue in people with neuromuscular disease (NMD), MS, or chronic fatigue (41, 42), but the relationship between fatigue and self-efficacy in migraine patients has not been examined. In our study, a fair correlation was found between fatigue and self-efficacy. We attribute this result to those with high self-efficacy being better able to cope with fatigue as a result of predicting fatigue, taking required precautions, and avoiding triggers.

Compared with controls, migraine patients were found to spend most of their afternoons lying down (43). A Norway-based population study compared 300 migraine patients with individuals without headaches and found that migraineurs were three times more likely to have an ESS score of ≥10 (9). According to another study conducted in migraine patients, a significant relationship was shown with daytime sleepiness and mental and physical fatigue (44). In the study conducted by Seidel et al., the relationship between fatigue and daytime sleepiness in migraine patients was investigated, and it was reported that daytime sleepiness was more pronounced compared to controls, but the difference did not reach the level of statistical significance (31). In our study, no significant relationship was found between fatigue and daytime sleepiness. The ESS evaluates propensity to fall asleep during the day rather than sleep quality. The lack of a substantial relationship between daytime sleepiness and fatigue could be associated with the patients' sense of obligation to continue their daily activities.

It was stated that low sleep quality is also a result of migraine, and a significant negative relationship was found between sleep quality and pain frequency, and between sleep quality and headache days per month (31). Sleep problems at night were reported to worsen headaches, possibly by causing increased fatigue during the day (45), however the relationship between fatigue and sleep quality in migraine patients has not been investigated.

While no significant relationship was found between daytime sleepiness and fatigue in the present study, a significant relationship was observed between sleep quality and fatigue (total, cognitive and social aspects). Although we know that both scales are designed to detect sleep problems, the ESS evaluates daytime sleepiness, while the PSQI evaluates the quality of sleep with its various sub-parameters.

Studies have reported a negative relationship between chronic migraine and diet quality (46), but the relationship between a healthy eating attitude and fatigue has not been examined. In our study, no significant relationship was found between fatigue and attitudes towards healthy eating. Although the effects of healthy nutrition on fatigue were investigated in another sample group, we attribute the inability to demonstrate this effect to the limited variability in eating behaviors within our sample. We believe that the attitude towards healthy eating, which is one of the factors associated with fatigue, played a minor role and therefore its relationship with fatigue did not reach statistical significance.

In a study, it was shown that migraine patients move less and more cautiously even when they are not experiencing pain and their dynamic activity levels are lower than healthy controls (43). Several population-based studies have concluded that lower levels of physical activity are associated with higher migraine prevalence. Fatigue and physical activity levels have not been evaluated in migraine patients. In our study, no significant relationship was found between fatigue and physical activity levels in migraine. It was observed that the patients included in the study had a sedentary lifestyle, and we think that the relationship with the fatigue experienced by the patients could not be determined because they were not physically active This could be due to the predominantly sedentary lifestyle of the participants and the use of self-report measures rather than objective tools. Future studies employing wearable activity monitors may provide more accurate insights into the fatigue–activity relationship.

Limitations

The present study has potential limitations. It was not possible to control which phase of migraine (prodrome, attack, or postdrome) the patients included in the study were in because they could be in the prodrome or postdrome phases even if there was no pain at the time of data collection. Since the attack stage may affect the sensitivity thresholds of migraine patients, this may affect our results. A control group was not included because the primary aim was to characterize correlates of fatigue within the migraine population. We acknowledge that comparative case-control designs would be valuable in future research. Non-significant results may reflect limited statistical power and/or restricted variability within the sample; future studies with larger cohorts are warranted to confirm these findings. Data were collected during the COVID-19 pandemic; while we did not measure pandemic-related variables, we acknowledge the potential for contextual influences on psychosocial status.

CONCLUSION

Fatigue should not be neglected in patients with migraine. Fatigue in migraine patients is related to psychosocial and behavioral factors, which include depressive mood, pain catastrophizing, self-efficacy, and sleep quality. These factors should be comprehensively assessed for appropriate management. Due to the multidimensional nature of fatigue, we believe that new therapeutic approaches should be based on biopsychosocial models rather than purely biomedical ones.

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