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Original Article

The relationship of mood status, quality of life, and dietary intake with migraine symptoms among women with migraine

Fatemeh Moradi[1], Siavash Fazelian[2], Fariborz Khorvash[3], Gholamreza Askari[4]

[1]MSc Student, Department of Community Nutrition, School of Nutrition and Food Science, Isfahan University of Medical Sciences, Isfahan, Iran
[2]Clinical Research Development Unit, Ayatollah Kashani Hospital, Shahrekord University of Medical Sciences, Shahrekord, Iran
[3]School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran
[4]Food Security Research Center and Department of Community Nutrition, School of Nutrition and Food Science, Isfahan University of Medical Sciences, Isfahan, Iran

*Corresponding Author: Gholamreza Askari, Department of Community Nutrition, School of Nutrition and Food Science, Isfahan University of Medical Sciences, Isfahan, Iran.
Tel: (+98) 31 37923171,
Email: askari@mui.ac.ir

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Abstract

Background and aims: Migraine is a neurologic disorder with wide global spread. Quality of life (QOL) and dietary factors are important parameters in migraine management. The aim of this study was to evaluate the relationship of mood status, QOL, and dietary intake with migraine symptoms among women with migraine.

Methods: This cross-sectional study was conducted on 143 women with migraine aged 20–40 years who were randomly selected from two clinics in Isfahan, Iran. Data were collected using the Food Frequency Questionnaire for Assessing Dietary Patterns, a visual analogue scale for migraine headaches, the Migraine-Specific Quality of Life Questionnaire, and the Depression Anxiety Stress Scale. The serum level of calcitonin gene-related peptide (CGRP) was also measured.

Results: Participants' age and number of sleeping hours per 24 hours had significant relationship with migraine severity, depression and anxiety had significant relationship with migraine severity and the duration of migraine attacks, and QOL had significant relationship with migraine severity and the duration and frequency of migraine attacks. Daily intake of riboflavin also had significant relationship with frequency of migraine attacks, while daily intake of water had significant relationship with migraine severity ($P < 0.05$). However, serum level of CGRP had no significant relationship with migraine ($P > 0.05$). The relationships of vitamin D and magnesium intake with depression were also significant ($P < 0.05$).

Conclusion: Serum level of CGRP has no significant relationship with migraine attacks, while depression, anxiety, QOL, and magnesium and vitamin D intake have significant relationship with migraine attacks.

Keywords: Migraine, Depression, Mood status, Quality of life, Dietary intake

Introduction

Migraine is a highly prevalent neurologic disorder and the seventh leading cause of disability in the world (1). Almost 14% of people around the world experience migraine headaches (2). The average prevalence of migraine in Iran is also 14% (3). Migraine headaches are usually unilateral and throbbing and are associated with fatigue, restlessness, concentration impairment, disability (4), and mood disorders such as depression and anxiety which increase the risk of disability, activity limitation, and quality of life (QOL) impairment (5). In one third of patients, migraine headaches are preceded by aura which is a focal neurological phenomenon characterized by numbness in the face and the hands, unilateral muscular tremor and weakness, and difficulty in speaking (6). The high prevalence of migraine and its significant effects on the different aspects of life highlight the importance of the timely use of safe and effective treatments. The most basic goal of migraine treatment is to improve QOL (7).

The most important factors contributing to migraine include genetic factors, sleep disorders, anxiety, stress, hypertension, disturbances of the monoaminergic neurotransmitters (including serotonin and dopamine), and mitochondrial disorders. Moreover, recent studies provided evidence regarding the relationship of calcitonin gene-related peptide (CGRP), neurological inflammation, and improper nutrition with migraine and recommended further studies to produce firmer evidence in this area (8,9). CGRP is a 37-aminoacid neuropeptide with wide spread in the central and peripheral nervous systems. Its secretion increases during migraine attacks and is associated with better pain transmission, higher sensitivity of pain pathways, and neurogenic inflammation (10).

Improper nutrition is a key factor in the onset of migraine attacks. Therefore, proper nutrition can facilitate effective migraine management. The American Neurological Association introduced riboflavin, magnesium, and coenzyme Q10 as supplements with potential positive effects on migraine prevention, while some studies reported that these supplements had no significant relationship with migraine (11,12).

Although evidence recommends the high prevalence of

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psychological problems among patients with migraine, no study had yet evaluated the relationship of migraine with QOL measured using a migraine specific questionnaire. Therefore, the present study was conducted to bridge this gap. The aim of the study was to evaluate the relationship of mood status, QOL, and dietary intake with migraine symptoms among women with migraine.

Methods

Design

This cross-sectional study was conducted in 2019–2020 on 143 women with migraine randomly selected from Noor and Imam Musa Sadr clinics, Isfahan, Iran. Inclusion criteria were a definite diagnosis of migraine established by a neurologist based on the criteria of the International Classification of Headache Disorders (13), an age of 20–40 years, no pregnancy or breastfeeding, no affliction by serious physical or mental disorders, and agreement for participation.

Sample size was calculated with a depression prevalence of 25%, a confidence level of 95%, a power of 80%, and a *d* of 10% (14,15). Sample size calculation formula (Eq. 1) revealed that with these parameters, 143 participants were needed for the study.

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 P(1-P)}{d^2} \quad \text{Eq. (1)}$$

Data collection instruments

Study data were collected using the Food Frequency Questionnaire for Assessing Dietary Patterns, a visual analogue scale, the Migraine-Specific Quality of Life Questionnaire, and the Depression Anxiety Stress Scale. The Food Frequency Questionnaire for Assessing Dietary Patterns is a valid questionnaire for the assessment of dietary patterns and validation of other questionnaires on diet (16). In the present study, nutrition specialists trained participants how to complete this questionnaire and asked them to use graduated measures and pots for the accurate measurement of consumed food stuff. Participants completed this questionnaire on a daily basis and then, the amount of their consumed food stuff in one holiday and two non-holiday days was averaged. Values documented in the questionnaires were changed into grams and then, gram values were entered into the Nutritionist IV software to analyze and calculate consumed nutrients. Finally, the amounts of received calorie, macronutrients (i.e. carbohydrate, protein, and fat), and micronutrients (i.e., vitamin D, riboflavin, magnesium, and water) were extracted and reported.

A visual analogue scale (numbered 1–10) was used for assessing migraine severity. The scale also included items on the frequency of migraine attacks per month, length of each attack, and type of migraine (with or without aura). A neurologist completed this scale for participants.

The Migraine-Specific Quality of Life Questionnaire was developed by Glaxo Wellcome to assess the effects of migraine on QOL (17). It has fourteen items on QOL in the past one month. Items are scored from 1 ("Never") to 6 ("Always"). The possible total score of this questionnaire is 14–84, with higher scores showing better QOL. Masjedi et al. assessed and confirmed the validity and reliability of the Persian version of this questionnaire and reported that its Cronbach's alpha values among patients with all types of migraine, patients with chronic migraine, and patients with episodic migraine were 0.92, 0.91, and 0.92, respectively (17).

The Depression Anxiety Stress Scale was used for mood status assessment. As a valid instrument to assess the symptoms of negative emotions, this scale has 21 items in three seven-item subscales. Items are scored from zero ("Does not apply to me at all") to 3 ("Applies to me very much"). As this scale is the short form of its 42-item version, its scores should be doubled for interpretation (18). The validity and reliability of this scale were confirmed in previous studies (19). A study in Iran also confirmed the validity and reliability of the Persian version of this scale and reported that the Cronbach's alpha values of the whole scale and its depression, anxiety, and stress subscales were 0.91, 0.87, 0.85, and 0.89, respectively.

Blood sampling and laboratory tests

A blood sample was obtained from each participant after a twelve-hour fasting period and was kept at a temperature of –70°C. Serum level of CGRP was measured through enzyme-linked immunosorbent assay (ELISA). The microplate of the ELISA kit was pre-coated with a CGRP-specific monoclonal antibody bound with biotin and avidin conjugated to horseradish peroxidase. Blood samples were added to the plate and incubated and then, TMB (3,3', 5,5;-tetramethylbenzidine) substrate was added. Accordingly, plates with CGRP, biotin antibody, and Avidin showed color change. Enzyme-substrate reaction was ended by adding sulfuric acid and spectrophotometric measurement at a wave length of 450±2 nanometer and then, the concentration of CGRP in samples was compared with the standard curve of optic density variations.

Data analysis

The SPSS software (v. 20.0) was used for data analysis. Data were described using mean and standard deviation. The one-way analysis of variance was used to compare patients with aura and patients without aura respecting the baseline values of the study variables. Moreover, linear regression analysis was conducted to assess relationships among the study variables adjusted for the effects of potential confounders. The level of significance was set at less than 0.05.

Results

The mean of participants' age was 35.87±7.0 years. The mean scores of their depression, anxiety, and stress were respectively 17.01±10.14, 15.46±8.68, and 23.16±10.16,

denoting moderate depression, anxiety, and stress. Group comparisons revealed no significant differences between patients with and without aura respecting their demographic characteristics, mood status, QOL, migraine type, and migraine severity ($P > 0.05$; Table 1).

Linear regression analysis revealed that after adjusting the effects of potential confounders, participants' age and number of sleeping hours per 24 hours had significant inverse relationship with migraine severity, the mean scores of depression, anxiety, and stress had significant relationship with migraine severity and the duration of migraine attacks, and the mean score of QOL had significant relationship with migraine severity and the frequency and duration of migraine attacks ($P < 0.05$). However, the serum level of CGRP had no significant relationship with migraine severity and the frequency and duration of migraine attacks ($P > 0.5$; Table 2).

The results of linear regression analysis also showed that after adjusting the effects of potential confounders, the serum levels of vitamin D and magnesium had significant relationship with depression, daily intake of riboflavin had significant inverse relationship with the frequency of migraine attacks, and daily intake of water had significant inverse relationship with migraine severity ($P < 0.05$; Table 3).

Discussion

This study evaluated the relationship of mood status, QOL, and dietary intake with migraine symptoms among women with migraine. Findings showed that the number of sleeping hours per 24 hours had significant inverse relationship with migraine severity. Previous studies also reported that sleep quality among patients with migraine was lower than healthy individuals and had significant relationship with the frequency of migraine attacks, though its exact mechanism was reported to be unknown (20,21). Sleep disorders can stimulate migraine attacks, can be aggravated by migraine attacks, or can have a same pathophysiological mechanism (22).

We also found that depression and anxiety had significant relationship with migraine severity and the frequency of migraine attacks. Previous studies also reported the high prevalence of depression and anxiety among patients with migraine (23,24). Moreover, a study on 588 patients revealed that depression and anxiety had significant positive relationship with the frequency of migraine attacks

Table 1. Comparison of patients with aura and patients without aura respecting their characteristics

Characteristics	Mean ± Standard error			*P* value*
	Migraine with aura	Migraine without aura	Total	
Age (y)	36.62±6.2	35.53±7.34	35.87±7.0	0.359
Body mass index (kg/m²)	28.02±4.84	27.33±4.57	27.55±4.65	0.423
Sleeping hours per 24 h	7.44±1.83	7.25±2.07	7.31±1.99	0.573
Serum level of CGRP	99.6±112.13	129.77±179.59	120.28±161.64	0.224
Migraine severity	7.02±1.6	6.88±1.55	6.93±1.56	0.639
Frequency of migraine attacks	7.84±3.2	8.96±4.64	8.61±4.26	0.096
Duration of migraine attacks (h)	15.78±13.98	22.7±20.9	20.57±19.23	0. 06
Depression	18.17±10.26	16.47±10.09	17.01±10.14	0.358
Anxiety	16.71±9.31	14.88±8.37	15.46±8.68	0.266
Stress	24.53±10.33	22.53±10.07	23.16±10.16	0.281
Quality of life	43.89±26.22	39.68±25.51	41.01±25.72	0.371

*The results of one-way analysis of variance.

Table 2. The results of linear regression analysis to assess the relationship of participants' characteristics with migraine characteristics

Characteristics	Migraine severity				Frequency of migraine attacks				Duration of migraine attacks			
	Beta	Adjusted beta*	95% CI for beta	*P* value	Beta	Adjusted beta*	95% CI for beta	*P* value	Beta	Adjusted beta*	95% CI for beta	*P* value
Age (y)	–0.051	–0.228	–0.98, –0.004	0.035	–0.048	-0.079	–0.169, 0.073	0.436	–0.407	–0.148	–0.861, 0.046	0.078
Body mass index (kg/m²)	0.058	0.172	–0.003, 0.118	0.061	0.133	0.124	–0.043, 0.269	0.153	–0.037	–0.009	–0.618, 0.545	0.901
Sleeping hours per 24 h	–0.148	–0.059	–0.283, –0.018	0.042	0.031	0.014	–0.313, 0.375	0.859	0.185	0.019	–1.10, 1.471	0.776
Serum level of CGRP	0.001	0.078	–0.001, 0.002	0.370	0.001	0.002	–0.003, 0.006	0.524	–0.001	–0.011	–0.017, 0.015	0.869
Depression	0.210	0.191	0.008, 0.467	0.045	0.045	0.107	0.051, 0.400	0.022	–0.064	–0.034	–0.422, 0.295	0.726
Anxiety	0.350	0.01	0.061, 0.893	0.002	–0.071	–0.145	–0.164, –0.021	0.030	0.025	0.011	–0.321, 0.370	0.888
Stress	0.000	0.001	–0.035, 0.035	0.995	–0.094	–0.224	–0.183, 0.005	0.059	–0.490	–0.259	–0.823, 0.158	0.06
Quality of life	–0.01	–0.161	–0.12, –0.011	0.023	–0.061	–0.366	–0.087, –0.034	0.000	–0.432	–0.578	–0.531, –0.332	0.000

*Adjusted for the effects of potential confounders such as age and number of sleeping hours

Table 3. The results of linear regression analysis to assess the relationship of participants' dietary intake with migraine characteristics and mood status

Variables	Migraine severity			Frequency of migraine attacks				Duration of migraine attacks				Depression				Anxiety				Stress			
	Beta	Adjusted beta*	95% CI for beta	*P* value	Beta	Adjusted beta*	95% CI for beta	*P* value	Beta	Adjusted beta*	95% CI for beta	*P* value	Beta	Adjusted beta*	95% CI for beta	*P* value	Beta	Adjusted beta*	95% CI for beta	*P* value	Beta	Adjusted beta*	95% CI for beta	*P* value
Energy intake (kcal/day)	–0.012	–0.012	–0.001, 0.001	0.897	0.003	0.001	–0.002, 0.002	0.991	–0.001	–0.016	–0.008, 0.007	0.861	0.000	–0.009	–0.004, 0.004	0.923	0.002	0.109	–0.001 0.005	0.224	0.002	0.087	–0.002, 0.006	0.0333
Carbohydrate intake (g/d)	0.000	0.027	–0.004, 0.005	0.827	0.004	0.088	–0.008, 0.017	0.474	0.024	0.105	–0.031, 0.078	0.396	–0.001	–0.012	–0.31, 0.028	0.926	0.003	0.027	–0.022, 0.027	0.829	–0.009	–0.075	–0.038, 0.020	0.547
Protein intake (g/d)	–0.002	–0.029	–0.018, 0.014	0.819	–0.004	–0.023	–0.047, 0.039	0.856	0.084	0.107	–0.111, 0.278	.397	–0.022	–0.052	–0.127, 0.84	0.686	0.044	0.124	–0.044, 0.132	0.328	–0.039	–0.095	–0.143, 0.064	0.454
Fat intake (g/d)	0.002	0.026	–0.020, 0.025	0.833	0.038	–0.150	–0.099, 0.023	0.217	–0.203	–0.179	–0.476, 0.071	0.145	0.029	0.048	–0.119, 0.177	0.700	0.048	0.093	–0.076, 0.171	0.446	0.071	0.118	–0.075, 0.217	0.337
Vitamin D intake (mg/d)	0.024	0.019	–0.216, 0.309	0.868	0.211	0.06	–0.555, 0.978	0.587	0.234	0.015	–3.211, 3.679	0.893	0.227	0.188	–1.797, –0.246	0.023	–0.634	–0.090	–2.19, 0.922	0.421	0.125	0.015	–1.712, 1.963	0.893
Riboflavin	–0.197	0.104	–0.280, 0.574	0.304	–0.417	–0.321	–0.598, –1.423	0.048	0.762	0.033	–3.801, 5.325	0.742	–0.839	–0.069	–3.307, 1.630	0.503	0.525	0.050	–1.535, 2.586	0.615	–0.498	–0.041	–2.932, 1.936	0.686
Caffeine	0.000	0.026	–0.003, 0.003	0.773	0.006	0.136	–0.002, 0.014	0.128	0.020	0.095	–0.017, 0.056	0.288	–0.004	–0.041	–0.024, 0.015	0.655	–0.01	–0.108	–0.027, 0.006	0.229	–0.014	–0.127	–.0033, 0.005	0.158
Magnesium	–0.002	–0.153	–0.006, 0.002	0.241	0.005	0.125	–0.005, 0.016	0.330	–0.012	–0.063	–0.059, 0.036	0.628	0.325	0.229	–0.221, –0.031)	0.036	0.002	0.025	–0.019, 0.024	0.847	0.004	0.036	–0.022, 0.029	0.784
Water	–0.121	–0.140	–0.237, –0.002	0.026	–0.125	–0.067	–0.448, 0.197	0.443	–0.930	–0.111	–2.381, 0.521	0.207	–0.056	–0.013	–0.841, 0.729	0.889	–0.275	–0.072	–0.930, 0.381	0.49	–0.03	–0.007	–0.804, 0.744	0.939

*Adjusted for the effects of potential confounders such as age and number of sleeping hours

(25). Most migraine headaches are associated with mental and behavioral problems so that a bilateral relationship is considered between migraine and depression. Assessment of the symptoms appeared before and during migraine attacks in a study also revealed the probable involvement of hypothalamus (leading to depression, restlessness, and anxiety) and limbic system (leading to depression) (26). In line with our findings, a previous study showed that the number of days with migraine headaches per month had significant inverse relationship with QOL (27). Migraine is a severely debilitating disease and its significant effects on functional ability before, during, and after attacks significantly affect patients' QOL (28).

Study findings also revealed that riboflavin intake had significant relationship with the frequency of migraine attacks. Riboflavin catalyzes the activity of flavoenzymes in mitochondrial respiratory chain and thereby, alleviates clinical and biochemical anomalies in patients with mitochondrial metabolic errors. Given the abnormality of energy metabolism in the brain during migraine headaches, riboflavin is supposed to alleviate migraine headaches through this mechanism (29,30). A meta-analysis also reported the effectiveness of riboflavin in significantly reducing the frequency and the duration of migraine attacks (31), though the first clinical study into the effects of riboflavin on migraine headaches among children reported no significant difference between the intervention and the placebo groups probably due to the small sample size of the study (32). Another study also reported that water intake reduced the duration of migraine attacks and hence, recommended that adequate water intake by patients with migraine can help alleviate migraine attacks (33).

Our findings also showed that magnesium intake had significant relationship with depression. Magnesium has significant roles in glutamatergic transmission in the limbic system and the cerebral cortex, inflammation and oxidative stress, and regulation of serotonin, dopamine, and noradrenalin, and thereby, can alleviate depression (33). In contradiction with our findings, a study reported that magnesium intake had no significant relationship with depression (34). This contradiction is attributable to the differences between these studies in terms of their participants' characteristics and the effects of potential confounders. Moreover, our findings indicated that vitamin D intake had significant relationship with depression. Different studies reported the effectiveness of vitamin D in alleviating the symptoms of depression (34,35).

Limitations and strengths

This study had some limitations. For example, sample size was rather small due to financial and time limitations. The measurement of CGRP and micronutrients during migraine attacks was also not possible. Moreover, using a self-report questionnaire for assessing dietary patterns might have been associated with some measurement

What does this paper contribute to the wider global clinical community?

- Effective management of depression and anxiety, consumption of a healthy and balanced diet, and intake of adequate water can improve QOL among patients with migraine.
- QOL improvement among patients with migraine can improve their functional ability and reduce the costs of migraine treatment.

biases. On the other hand, the use of the Migraine-Specific Quality of Life Questionnaire, assessment of factors with potential effects on migraine, and assessment of factors with potential effects on mood status were among the strengths of the present study.

Conclusion

This study suggests that serum level of CGRP has no significant relationship with migraine attacks, while depression, anxiety, QOL, and magnesium and vitamin D intake have significant relationship with migraine attacks.

Conflict of Interests

The authors declare no conflict of interests.

Ethical approval

The Ethics Committee of Isfahan University of Medical Sciences, Isfahan, Iran, approved this study (code: IR.MUI.RESEARCH.REC.1398.499). Participants were provided with adequate information about the study aim and were ensured of data confidentiality. Their questions were also answered and written informed consent was obtained from all of them. They were also informed that they could access the result of their dietary intake analysis and its interpretation at personal request at the end of the study.

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