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

Fatemeh Moradi1, Siavash Fazelian1, Fariborz Khorvash1, Gholamreza Askari1

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

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. However, serum level of CGRP had no significant relationship with migraine attacks. The relationships of vitamin D and magnesium intake with depression were also significant.

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, 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
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.

\[ n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 P(1-P)}{d^2} \]  
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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Migraine with aura</th>
<th>Migraine without aura</th>
<th>Total</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>36.62±6.2</td>
<td>35.53±7.34</td>
<td>35.87±7.0</td>
<td>0.359</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>28.02±4.64</td>
<td>27.33±4.57</td>
<td>27.55±4.65</td>
<td>0.423</td>
</tr>
<tr>
<td>Sleeping hours per 24 h</td>
<td>7.44±1.83</td>
<td>7.25±2.07</td>
<td>7.31±1.99</td>
<td>0.573</td>
</tr>
<tr>
<td>Serum level of CGRP</td>
<td>99.6±112.13</td>
<td>129.77±179.59</td>
<td>120.26±161.64</td>
<td>0.224</td>
</tr>
<tr>
<td>Migraine severity</td>
<td>7.02±1.6</td>
<td>6.88±1.55</td>
<td>6.93±1.56</td>
<td>0.639</td>
</tr>
<tr>
<td>Frequency of migraine attacks</td>
<td>7.84±3.2</td>
<td>8.96±4.64</td>
<td>8.61±4.26</td>
<td>0.096</td>
</tr>
<tr>
<td>Duration of migraine attacks (h)</td>
<td>15.78±13.98</td>
<td>22.7±20.9</td>
<td>20.57±19.23</td>
<td>0.06</td>
</tr>
<tr>
<td>Depression</td>
<td>18.17±10.26</td>
<td>16.47±10.09</td>
<td>17.01±10.14</td>
<td>0.358</td>
</tr>
<tr>
<td>Anxiety</td>
<td>16.71±9.31</td>
<td>14.88±8.37</td>
<td>15.46±8.68</td>
<td>0.266</td>
</tr>
<tr>
<td>Stress</td>
<td>24.53±10.33</td>
<td>22.53±10.07</td>
<td>23.16±10.16</td>
<td>0.281</td>
</tr>
<tr>
<td>Quality of life</td>
<td>43.89±26.22</td>
<td>39.68±25.51</td>
<td>41.01±25.72</td>
<td>0.371</td>
</tr>
</tbody>
</table>

*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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Migraine severity</th>
<th>Frequency of migraine attacks</th>
<th>Duration of migraine attacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta</td>
<td>Adjusted beta*</td>
<td>95% CI for beta</td>
<td>P value*</td>
</tr>
<tr>
<td>Age (y)</td>
<td>-0.051</td>
<td>-0.228</td>
<td>-0.98, -0.004</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>0.058</td>
<td>0.172</td>
<td>-0.003, 0.118</td>
</tr>
<tr>
<td>Sleeping hours per 24 h</td>
<td>-0.148</td>
<td>-0.059</td>
<td>-0.283, -0.018</td>
</tr>
<tr>
<td>Serum level of CGRP*</td>
<td>0.001</td>
<td>0.078</td>
<td>-0.001, 0.002</td>
</tr>
<tr>
<td>Depression</td>
<td>0.210</td>
<td>0.191</td>
<td>0.008, 0.467</td>
</tr>
<tr>
<td>Anxiety</td>
<td>0.350</td>
<td>0.001</td>
<td>0.061, 0.893</td>
</tr>
<tr>
<td>Stress</td>
<td>0.000</td>
<td>0.001</td>
<td>-0.015, 0.035</td>
</tr>
<tr>
<td>Quality of life</td>
<td>-0.01</td>
<td>-0.161</td>
<td>-0.12, -0.011</td>
</tr>
</tbody>
</table>

*Adjusted for the effects of potential confounders such as age and number of sleeping hours.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Migraine severity</th>
<th>Frequency of migraine attacks</th>
<th>Duration of migraine attacks</th>
<th>Depression</th>
<th>Anxiety</th>
<th>Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta</td>
<td>Adjusted beta*</td>
<td>95% CI for beta</td>
<td>P value</td>
<td>Beta</td>
<td>Adjusted beta*</td>
</tr>
<tr>
<td>Energy intake (kcal/day)</td>
<td>-0.012</td>
<td>-0.012</td>
<td>-0.003 to 0.003</td>
<td>0.977</td>
<td>0.003</td>
<td>0.001 to 0.003</td>
</tr>
<tr>
<td>Carbohydrate intake (g/d)</td>
<td>0.000</td>
<td>0.027</td>
<td>-0.004 to 0.005</td>
<td>0.827</td>
<td>0.004</td>
<td>0.008 to 0.017</td>
</tr>
<tr>
<td>Protein intake (g/d)</td>
<td>-0.002</td>
<td>-0.029</td>
<td>-0.018 to 0.014</td>
<td>0.819</td>
<td>-0.004</td>
<td>-0.023 to 0.019</td>
</tr>
<tr>
<td>Fat intake (g/d)</td>
<td>0.002</td>
<td>0.026</td>
<td>-0.020 to 0.038</td>
<td>0.833</td>
<td>0.038</td>
<td>-0.150 to 0.217</td>
</tr>
<tr>
<td>Vitamin D intake (mg/d)</td>
<td>0.024</td>
<td>0.019</td>
<td>-0.216 to 0.309</td>
<td>0.868</td>
<td>0.211</td>
<td>0.06 to 0.555</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>-0.197</td>
<td>0.014</td>
<td>-0.280 to 0.574</td>
<td>0.104</td>
<td>-0.417</td>
<td>-0.321 to -0.121</td>
</tr>
<tr>
<td>Caffeine</td>
<td>0.000</td>
<td>0.026</td>
<td>-0.001 to 0.003</td>
<td>0.773</td>
<td>0.006</td>
<td>0.136 to 0.016</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.002</td>
<td>-0.553</td>
<td>-0.006 to 0.006</td>
<td>0.241</td>
<td>0.005</td>
<td>0.125 to 0.016</td>
</tr>
<tr>
<td>Water</td>
<td>-0.121</td>
<td>-0.140</td>
<td>-0.237 to -0.002</td>
<td>0.226</td>
<td>-0.125</td>
<td>-0.067 to -0.446</td>
</tr>
</tbody>
</table>

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

LIMITATIONS AND STRENGTHS

Our findings also showed that magnesium intake had significant relationship with depression. Magnesium has significant roles in glutamate transmission in the limbic system, mitochondrial respiration, and regulation of serotonin, dopamine, and noradrenalin, and thereby, can alleviate depression (33). In contrast with our findings, a study reported that riboflavin had no significant effect on depression (19). Another study also reported that water intake reduced the duration of migraine attacks (20). Study findings also revealed that riboflavin intake had significant inverse relationship with QOL (28). Migraine headaches are associated with mental health effects of energy metabolism in the brain during migraine attacks (29). Additionally, mitochondrial respiratory chain and thereby, riboflavin has significant roles in mitochondrial function. Patients with migraine headaches also reported that the diet has a significant effect on functional ability before and during migraine attacks (30). In a study of migraine and depression, a significant inverse relationship with QOL (27). Migraine headaches are associated with mental health effects of energy metabolism in the brain during migraine attacks (29). Additionally, mitochondrial respiratory chain and thereby, riboflavin has significant roles in mitochondrial function. Patients with migraine headaches also reported that the diet has a significant effect on functional ability before and during migraine attacks (30). In a study of migraine and depression, a significant inverse relationship with QOL (27). Migraine headaches are associated with mental health effects of energy metabolism in the brain during migraine attacks (29). Additionally, mitochondrial respiratory chain and thereby, riboflavin has significant roles in mitochondrial function. Patients with migraine headaches also reported that the diet has a significant effect on functional ability before and during migraine attacks (30). In a study of migraine and depression, a significant inverse relationship with QOL (27).
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 and its interpretation at personal request at the end of the study.

**Acknowledgement**

We would like to thank all participants of the study as well as all individuals who collaborated with us during the study.

**References**


