



# Nutrition Triggers Migraine Headache: A Cross-Sectional Study in Southern Iran about the Nutrition Habits in Migraine Patients

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## ABSTRACT

**Introduction:** Migraine is recognized as the second most disabling disease in the world, accompanied by Bell's palsy, hearing loss, and cerebral nerve paralysis. Therefore, this study aimed to evaluate the effect of dietary triggers on the exacerbation of migraine headaches for the first time in Hormozgan province, Iran.

**Method:** Individuals were randomly selected from the population of migraine patients referred to the hospital of Shahid Mohammadi in Bandar Abbas (located in southern Iran). A two-stage questionnaire was used, including demographic information and dietary habits of individuals with migraines, containing six types of drinks, 11 types of food, and a fasting diet.

**Results:** This study examined 200 individuals, including 66.5% women and 33.5% men. The age range of participants was from 13 to 66 years old, and the mean age of the study population was 31.42 years. Fasting showed the highest headache exacerbation, followed by coffee, alcoholic beverages, and high-fat foods. The least stimulating type can be attributed to non-alcoholic carbonated and soft drinks. Nuts and walnuts (good sources of omega-3) seemed to be the least irritating among the population, although citrus fruits were not significantly different.

**Conclusion:** Based on the results, all migraine patients should avoid fasting strictly, keep their sugar levels balanced, and prevent excessive consumption of alcohol and caffeine. The results of subsequent studies will clarify the effect of these two substances on headaches.

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## Introduction

Headaches start following some stimuli and go through a four-stage cycle so that the person experiences frequent headache attacks, usually called migraine headaches (1). Migraine is recognized as the most common neurological problem in primary care and the second most disabling disease in the world, affecting 1-2% of the general population in the chronic phase (2). Nerve transmitters, known as serotonin (5-HT) (3-5), are usually involved in pain. The decreased serotonin activity is the stimulatory factor for pain receptors associated with trigeminal nerves (3). Increased sensitivity of the trigeminal nerves is the factor that stimulates pain receptors and creates the headache phase in the migraine cycle. Trigeminal nerves can create the prodrome and aura phase during increased sensitivity (4). The trigeminal nerves innervate

cerebral vessels (trigeminovascular system) (5), especially the pial, arachnoid, and dural veins (6, 7). Neuropeptides, stimulating the trigeminoscular system and dilating pial and dural vessels, make the most likely physiology of migraine as the main reason for Allodynia, along with migraine, which permission triggers stimuli to the trigeminovascular system and starts headache attacks (8). Indeed, serotonin changes under the influence of food and diet, and food generally plays a role in the synthesis and function of serotonin through its precursors, such as tryptophan (serotonin metabolite primary substance) (9).

Stimulating foods containing caffeine and alcoholic beverages are the most well-known dietary triggers for migraine exacerbation (10). Diets high in folate, low in fat, and rich in omega-3 and -6 can effectively regulate nerve terminals and reduce the severity of headache attacks (11).

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Glancing at recent articles does not answer the ambiguity between food or diet and migraine; conflicting results can be observed and lead to confusion. Recent articles have evaluated limited nutrition or drinks. This study discussed the possible role of nutrition and diet in migraine control with six types of drinks, 11 types of food, and a fasting diet. All patients (referred to a hospital in Bandar Abbas) identified their nutrition usage as a worsening of migraine headaches.

### **Materials & Methods**

An observational, cross-sectional study was conducted in Bandar Abbas, Hormozgan Province, Iran. This study was conducted in a single Shahid Mohammadi Hospital (Bandar Abbas) center and improved by The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for reporting observational studies(12).

### **Study Design and Oversight**

This study was conducted after obtaining ethics approval from the Ethics Committee of the Hormozgan University of Medical Sciences. A questionnaire was prepared by neurologist specialists at the hospital and provided to migraine patients who visited the hospital between 2020 and 2021. Demographic information from these case participants in this trial, extracted based on a validated and reliable administered 18-item semi-quantitative food frequency questionnaire (FFQ), was applied to assess dietary intakes(13).

### **Study Data Collection**

All necessary information was collected by a two-stage electronic questionnaire:

The first stage focused on demographic information such as age, gender, occupation, underlying diseases, and use of specific medications based on a self-made checklist under neurologist supervision.

For the second stage, a paper questionnaire was given to each person. When the patient did not have the necessary literacy to fill it out, the companion introduced by the patient was asked to fill out the questionnaire with the patient's help. Based on the National Health and Nutrition Examination Survey (NHANES) measure, six types of drinks, 11 types of food, and a fasting diet (including skipping at least one, two, or all three meals from breakfast, lunch, or dinner)

were included in the questionnaire. Each person marked these items to determine if it affected their headache severity and duration.

All the items entered in the questionnaire were cheese, chocolate, citrus, hot dog, bologna, ice cream, light coffee, strong coffee, alcoholic drinks, on-alcoholic carbonated drinks, onion, milk, nuts, soft drinks, walnuts, greasy and fasting.

All steps are mentioned in the informed consent. There was no direction to answer the questions, and the principle of non-bias was observed.

### **Study Population**

All patients diagnosed with migraine between 2020 and 2021 and met the inclusion criteria were examined. The definition of migraine was reviewed based on the International Classification of Diseases 11<sup>th</sup> (ICD-11) checklist. According to this criterion, disabling attacks lasting 4 to 72 hours with moderate or severe headaches usually occur with nausea, vomiting, and/or photophobia and phonophobia and are sometimes preceded by a short-term aura of central nervous system dysfunction of visual, sensory, or other unilateral symptoms. Each case was checked with a neurologist and finally entered into the study. The study excluded those who did not consent and did not differentiate migraine with aura from migraine without aura. A limit was not set on the adult rate age, but non-native patients were excluded and ignored.

### **Study Data Analysis**

The sampling method was random among the patients referred to Shahid Mohammadi Hospital in Bandar Abbas. The "Rand Company" random number table was used for chosen cases; 856 patients were accessed, and just 200 cases were needed based on recent studies. Acceptable type 1 error of  $P=0.05$ ,  $d=0.06$  considered for the determined sample size.

Other information was statistically analyzed using SPSS version 23 software. Descriptive statistical indices such as median, mean, mode, etc., and statistical analysis using chi-square and t-tests were used to provide descriptive analyses. Frequency indices were used to prepare tables made by Microsoft Word.

## **Results**

### **Study Participant Selection**

In total, 856 patients with migraine were available in the considered period. In addition, 48

people with migraine were referred to the neurology department from nearby cities and were not residents of Hormozgan province. First, 200 people were randomly selected, of whom 34

were unwilling to participate in the study. Finally, 34 people were randomly selected from the remaining population, similar to the previous stage (Figure 1).

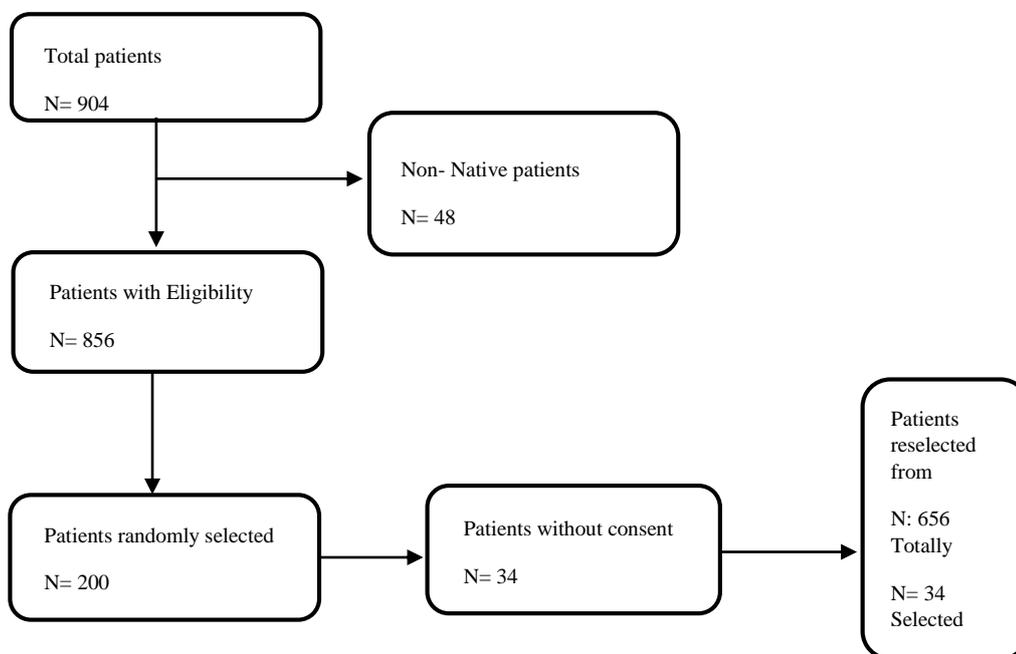


Figure 1. Participant selected steps.

**Population Outcome**

Of the 200 individuals studied, 66.5% were female and 33.5% were male. The age range of the participants was from 13 to 66 years old, with a mean age of 31.42 years (Table 1). Contrary to previous reports that introduced migraine as a disabling and limiting disease, a small proportion of the study population (7% of the total population) were unemployed. However, considering the age range starting from 13 years

old, this low number can be overlooked, and it can be concluded that migraine does not interfere with employment. Since there are relatively few self-employed individuals on the one hand and a high proportion of students (about a quarter of the population) and employees/workers (34%), migraines are not a barrier to participation in educational and administrative environments (Table 1).

Table1. Demographic information along with family information of each person by number and percentage.

Age	Highest	Lowest	Average
	66 Years	13 Years	31.42
Gender		Number	Percent
	Male	67	33.5
	Female	133	66.5
Occupation			
	Student	51	25.5
	Employee/Worker	68	34
	Housewife	52	26
	Freelance	22	11
	Unemployed	7	3.5

### Main Outcome

The highest rate of headache exacerbation was observed in fasting individuals, but as expected, coffee, alcoholic beverages, and fatty foods had the most significant effect on exacerbating headaches. Among the drinks, the least stimulating type can be attributed to non-alcoholic carbonated and soft drinks. Nuts and

walnuts (omega-rich sources) seemed to be the least irritating among the population, although citrus fruits were not significantly different. Cheese and milk were as irritating as hot dogs and sausages in close proportions. Foods with almost similar raw materials stimulate migraines in almost the same proportion. The results of other foods are evident in Table 2.

**Table 2.** Foods associated with migraine exacerbation that are used and not used regularly in the affected population. The food was determined according to previous studies and approved by the Department of Neurology.

Food Items	Used percent	Not used percent
Cheese	12.5	87.5
Chocolate	11.5	88.5
Citrus	8	92
Hot dog	20.5	79.5
Bologna	22.5	77.5
Ice cream	12.5	87.5
light coffee	23.5	76.5
Strong coffee	37	63
Alcoholic drinks	29	71
Non-alcoholic carbonated drink	14	86
an onion	20	80
Milk	12	88
Nuts	7	93
Soft drinks	14	86
Walnut	5	95
greasy	34	66
Fasting	70.5	29.5

### Discussion

Fasting had the most significant role in exacerbating migraine headaches. Maintaining a constant glucose level in the blood with frequent and small meals and snacks can be a suitable strategy for reducing migraine headaches and preventing fasting. Avoiding food and fasting can be a trigger and exacerbating factor for migraine headaches. Stimulant foods such as caffeine and coffee had the highest rate after fasting. Hufnagel stated that starting and exacerbating headaches is the result of more than one dietary stimulant (14). About 12 to 60% of people attribute food as a migraine stimulant, which can stimulate the migraine cycle in terms of smell or food sensitivity. Nevertheless, low-fried foods, dairy products, fewer caffeine products, white bread, and meat may reduce symptoms or frequency of migraines. Additionally, diets rich in fat, carbohydrates, or caffeine and alcoholic beverages are considered exacerbating factors for migraine attacks by interaction with serotonin metabolite (15).

Nerve transmitters are usually involved in the process of pain, which can be mentioned as serotonin (5-HT), hypocretins (HCRT), norepinephrine (NE), and gamma-aminobutyric acid (16-19). The central nervous system (CNS) produces its serotonin from a separate source but still requires tryptophan. A decrease in blood tryptophan also decreases serotonin in the CNS. Alcohol consumption reduces the necessary level of tryptophan for serotonin synthesis (16), chronic alcohol consumption with a risk of liver damage, and tryptophan synthesis is affected by liver damage (20). Conversely, Matias reported a negative correlation between alcohol consumption and the risk of migraine (21). In another study, alcohol was identified as one of the most common migraine triggers (21), which was confirmed in the present results. Eventually, patients may benefit from limiting alcoholic beverages, especially red wine (22).

Foods that lead to an increase in blood sugar are likely to intensify headache attacks. Lorenzo Del Moro found that the high demand for brain cells

and glucose receptors in the brain during headaches exacerbated attacks (23). Increased blood glucose levels may be a stimulant for reducing serotonin and intensifying migraines. Diabetic patients showed a positive correlation between hypoglycemic attacks and migraines. This high demand, along with a decrease in blood sugar, intensified attacks in both diabetic and non-diabetic individuals (24). Fasting and hunger control enzymes that are effective in serotonin synthesis (tryptophan hydroxylase, reductase, and dihydropyridine reductase) (25, 26) reduce serotonin levels, which is a common condition in migraines and are favorable for migraine attacks. From a nutritional standpoint, it is essential for these patients to follow a suitable diet, not to abstain from food or fasting. The Dietary Approaches to Stop Hypertension (DASH) diet is generally designed for patients with high blood pressure, but it is also highly recommended for migraine patients (25). DASH diet reduced migraine index (MI) and headache dairy result (HDR) in migraine patients (26). Vegan and low-fat diets helped reduce headaches and improve outcomes (27). Sanders reduced the prevalence of headaches in patients by following a diet rich in unsaturated fatty acids and omega-3s (28). Diets rich in omega-3s and less omega-6 (or nutrients same as Nuts and walnuts) were also effective in reducing the frequency and duration of chronic headaches in patients (29). In addition, ketogenic diets with lower glycemic index were identified as a factor in reducing headaches in migraine patients (30). Obesity alone has a significant association with migraine headaches. Obesity-dominant diets are usually high-calorie, high-fat, and high-carbohydrate, which, according to our results, are a potent stimulant for starting migraine attacks.

Migraine headaches tend to be less frequent and intense when wheat, citrus fruits, eggs, cheese, chocolate, and milk are avoided in the diet (based on our results). A small percentage of individuals identified chocolate as an exacerbating factor for migraine headaches in the present results, but LIPPI and colleagues did not recommend avoiding chocolate and cocoa in migraines based on scientific evidence (31). Other stimulants, such as hot dogs, ice cream, canned foods, and carbonated non-alcoholic beverages, can also exacerbate migraine headaches.

In summary, a fasting diet and avoiding eating food for a long time can be the onset and

exacerbation factors of migraines. In addition, high-fat and high-carb diets are considered an essential factor in aggravating headaches. Alcohol and coffee need more studies to decide. Migraine sufferers are recommended to avoid these substances. Maintaining stable glucose levels by eating small, frequent meals and snacks can be a strategy that may prevent headaches caused by fasting. Additionally, avoiding food for a long time can initiate and aggravate migraine headaches. Nevertheless, diets rich in sugar and fat, along with caffeine or alcohol, can stimulate the nerve pathways effective in aggravating headaches (sympathetic and parasympathetic).

## Conclusion

Based on the results, all migraine patients should avoid fasting strictly, keep their sugar levels balanced, and prevent excessive consumption of alcohol and caffeine. The results of subsequent studies will clarify the effect of these two substances on headaches. Migraine patients should pay attention to maintaining a balanced weight and not consuming fatty foods, and replace other drinks with non-alcoholic and caffeine-free drinks.

## Statements and Declarations

### **Ethics Approval**

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors. The present study is part of a Doctor of Medicine dissertation (Ethics code: IR.HUMS.REC.1400.360) in social work approved by the University of Hormozgan Medical Sciences Consent for publication. An informed consent was obtained from all participants regarding the publication of information obtained. This article does not contain any studies with animals performed by any of the authors.

### **Consent for Publication**

Not applicable.

### **Availability of Data and Materials**

The datasets used or analyzed during the current study are available from the corresponding author upon reasonable request.

### Competing Interests

The corresponding author states no conflict of interest on behalf of all authors.

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### Conflict of Interest

There is no conflict of interest for this investigation.

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