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Physical and dietary interventions in managing migraine. A review of the literature

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ABSTRACT

Migraine is a prevalent, burdensome, debilitating neurological disorder that poses a socioeconomic burden, significantly impacting the quality of life. The recommended migraine management is pharmacological treatment. However, because of its constraints like side effects and the risk of drug overuse, the need for alternative approaches has emerged. This review explores non-pharmacological approaches to migraine management, focusing on dietary and physical interventions based on existing literature found in databases. The role of nutritional strategies such as ketogenic, low-glycemic, and low-fat diets, as well as elimination diets and supplementation with omega-3 fatty acids, vitamins, and probiotics, is discussed regarding their effects on migraine pathophysiology. Physical interventions, which include exercise, yoga, and manipulative therapies, also show promise in relieving symptoms by affecting migraine pathophysiology. These interventions can reduce migraine frequency, severity, and duration. However, the evidence varies in quality, hence further high-quality research is required to establish long-term efficacy and safety of these measures. Personalized approaches show promise for optimizing non-pharmacological migraine management. This review highlights the growing role of dietary and physical strategies as complementary options for improving the quality of life of individuals with migraines.

Keywords: Migraine management, Headache, Non-pharmacological treatments, Dietary interventions, Physical interventions

1. INTRODUCTION

Migraine is one of the most common and disabling neurological disorders, affecting approximately 15% of the global population, with chronic migraine impacting 1–2% of individuals (Steiner and Stovner, 2023; Andreou and Edvinsson, 2019; Burch et al., 2019). It is estimated to affect 12% of individuals in the United States, including 18% of women and 6% of men (Burch et al., 2019). Unfortunately, the worldwide prevalence of migraine has risen significantly over the past 30 years, though it can be connected to migraine's young history as a subject of studies (Amiri et al., 2022; Steiner and Stovner, 2023). From a public health perspective, migraine ranks as the second most disabling and burdensome condition globally, affecting social and economic aspects of life, which contributes to years lived with disability (YLDs) (Burch et al., 2019; Steiner and Stovner, 2023).

The condition is episodic, characterized by recurrent, often severe headaches. Symptoms such as nausea, vomiting, and sensitivity to light (photophobia) and sound (phonophobia) can accompany migraine, significantly impairing quality of life (World Health Organization, 2024; Andreou and Edvinsson, 2019). Migraine attacks happen as pulsating headaches of moderate or severe intensity, which can occur one-sidedly or have their localization behind an eye. Physical activity worsens the attacks lasting up to 2-3 days (World Health Organization, 2024). A migraine attack consists of phases. Firstly, a premonitory one happens, including transient neurological symptoms called aura. Then, there is an intense headache attack, and, finally, a postdrome phase occurs. Factors like stress and lack of sleep can trigger the attack (Andreou and Edvinsson, 2019).

Chronic migraine, characterized by headaches occurring on 15 or more days per month (Ferrari et al., 2022), is a disabling lifespan condition associated with physical and mental health issues, increased need for healthcare resources, lower socioeconomic status, and a decreased health-related quality of life (Simmonds et al., 2023; Andreou and Edvinsson, 2019; Burch et al., 2019). It also has a connection to cardiovascular and psychiatric diseases, as well as sleep disorders (Burch et al., 2019). Despite its high prevalence and impact, the exact cause of migraine remains unclear (Andreou and Edvinsson, 2019). Genetic and environmental factors affect its pathophysiological mechanism, which involves the release of inflammatory substances around the blood vessels and nerves in the head.

Migraine affects women more often due to its connection to hormonal changes and starts already during puberty (World Health Organization, 2024; Andreou and Edvinsson, 2019). Current treatment focuses on symptom relief with the use of medications such as NSAIDs (nonsteroidal anti-inflammatory drugs), triptans, 5HT1B/1D (5-hydroxytryptamine receptor 1B) receptor agonists, and neuromodulation techniques (Ferrari et al., 2022). However, their adverse effects, contraindications, or risk of drug overdose, limit these approaches and create the need for a different migraine treatment (Yarnitsky et al., 2019). Physical and dietary interventions have shown potential benefits, modulating key mechanisms of migraine, such as inflammation, mitochondrial dysfunction, and the gut-brain axis disturbance. This review describes the role of physical and dietary interventions in migraine management, explains the evidence on specific strategies, and identifies areas for future research.

2. METHODOLOGY

This article reviews the literature on different strategies in migraine management. The authors searched the PubMed database for eligible studies addressing the effectiveness of non-pharmacological treatments for migraine, especially dietary and physical interventions. The search was limited to articles published within the last 5 years (except one article within the previous 10 years) and filtered to include Meta-Analyses, Reviews, and Systematic Reviews.

The used keywords were: "migraine and non-pharmacological", "migraine and non-pharmacological treatments", "migraine and physiotherapy", "migraine and physical therapy", "migraine and physical activity", "migraine and yoga" and "migraine and diet". A preference was given to meta-analyses and systematic reviews, which provide summaries of existing research in order to include the most crucial evidence. When discussing strategies with extensive prior research, this approach was particularly advantageous. Authors prioritized the most recent literature for broadly researched interventions.

3. RESULTS AND DISCUSSION

Physical Interventions

Physical interventions have shown potential benefits for migraine management. They include a variety of therapies, such as exercises or manual therapy techniques.

Exercise-Based Interventions

A promising non-pharmacological intervention for migraine prevention is exercise therapy (Demarquay et al., 2021). Aerobic exercises have shown a clear benefit when used as an individual means of prophylaxis or reinforcement of pharmacological prevention (Demarquay et al., 2021). Another article discussed moderate-intensity and high-intensity training, as well as strength/resistance training, as associated with a reduced migraine frequency. When compared, strength and resistance training demonstrated the highest efficacy. It was probably due to its focus on targeted muscular strengthening and neuromuscular adaptations, especially in the neck, shoulders, and upper limbs. These exercises may modulate nociceptive input from cervical spine structures closely linked to the trigeminocervical system implicated in migraine pathophysiology. What is worth mentioning is that meta-analyses highlight that all exercise intensities, compared to placebo, resulted in significant reductions in migraine burden, with strength training ranked as the most effective. The authors indicated that strength/resistance training and active recovery days provided the most optimum efficacy in treating migraine (Woldeamanuel and Oliveira, 2022).

Additionally, a study of supervised, lasting at least six weeks exercise programs showed a positive impact on the quality of life. However, the overall certainty of evidence remained very low due to variability and risk of bias across studies. Accordingly, the authors made a weak recommendation to incorporate supervised physical activity into standard pharmacological migraine treatment (Beier et al., 2022).

Yoga

The evidence on yoga as a migraine preventive measure is scarce and cannot support a confident recommendation. Although early evidence suggested its benefits were more prominent for tension-type headaches, a recent meta-analysis of randomized controlled trials indicated potential advantages for migraineurs. Yoga practice demonstrated positive effects on headache days, disability, and quality of life when used as an additional therapy (Demarquay et al., 2021). Conducted studies have indicated reductions in migraine frequency, pain intensity, disability, and associated symptoms like stress, anxiety, and depression, highlighting the potential of yoga as an adjunctive therapy for migraine prevention (Kachhadia et al., 2023; Nayar et al., 2022).

Its benefits are attributed to improved cardiac autonomic function, reduced sympathetic activity, increased nitric oxide levels, which acts as an endothelium-derived relaxing factor-like substance, and reduced tension in trigger areas for migraines such as the head, neck, and temporal regions (Kachhadia et al., 2023). Yoga also improves mind-body awareness and helps patients recognise early signs of discomfort, and take actions preventing migraine from fully developing. Additionally, studies proved that yoga helps migraineurs manage anxiety, depression, and stress (Kachhadia et al., 2023; Nayar et al., 2022).

A minimum six-week yoga program practiced three times a week has demonstrated efficacy, earning it a grade B recommendation in clinical practice guidelines, meaning it "might" help improve symptoms (Kachhadia et al., 2023). A study conducted in adults suggests that yoga may also serve as a standalone prophylaxis, decreasing pain, disability, and stress (Begasse-de-Dhaem and Bernstein, 2024). Aligning with the WHO's vision for cost-effective, universal health interventions, yoga holds promise as a complementary option in migraine management (Kachhadia et al., 2023; Begasse-de-Dhaem and Bernstein, 2024).

Manipulative Therapies

Manipulative therapy techniques, including spinal manipulation, joint mobilization, and osteopathic or chiropractic treatments, are another category of physical interventions evaluated for migraine management. These interventions target joints, muscles, and connective tissues, often focusing on the cervical, thoracic, and lumbar spine (Beier et al., 2022). Studies suggest that manual therapies such as spinal manipulation can have short-term benefits for reducing headache frequency and intensity, comparable to pharmacological options like amitriptyline (Smith et al., 2019).

However, their impact on outcomes, such as migraine days or analgesic use, remains unclear, and most studies report low certainty of evidence due to the imprecision and variability in the methods (Beier et al., 2022). Despite these limitations, because of their safety and no serious adverse events, manual therapies may be preferred by patients with concurrent neck pain (Beier et al., 2022). In light of this, the authors made a weak recommendation to supplement manual therapy to a standard treatment (Beier et al., 2022).

Dietary Interventions

The role of dietary interventions in migraine management has been broadly researched. While some approaches show promise in migraine treatment, many still require more research to make a specific conclusion. This section of the article reviews interventions most widely discussed in the literature.

Supplementation

Migraine management often incorporates supplementation to address potential nutritional deficits or metabolic dysfunctions associated with the condition.

Coenzyme Q10

Coenzyme Q10 (CoQ10) supplementation at 300 mg daily is efficacious in migraine prophylaxis (Demarquay et al., 2021; Haghdoost and Togha, 2022). CoQ10 is an antioxidant vital for mitochondrial energy production, investigated for its role in migraine prophylaxis. Randomized clinical trials proved that its supplementation reduces migraine attack frequency by approximately two episodes monthly. However, it showed no considerable impact on attack severity and duration (Parohan et al., 2020). CoQ10 supplementation is well-tolerated and safe, which makes it a feasible non-pharmacological option for migraineurs (Haghdoost and Togha, 2022).

Vitamins and minerals

A wide range of vitamins and minerals proved beneficial for migraineurs (Gazerani, 2021). Table 1 describes the ones most broadly discussed in the literature.

Table 1 Effects of the supplementation of vitamins and minerals in migraine management

Supplemented vitamin/mineral	Mechanism	Effect	Source
Riboflavin (Vitamin B2)	At a high dose of 400 mg daily benefits migraine management, as being effective in the enhancement of mitochondrial function and neuroprotection	Preventing migraine attacks and modifying their duration	(Demarquay et al., 2021; Spekker and Nagy-Grócz, 2023; Shaik and Gan, 2015)
Vitamin E	Decreases the level of endometrial prostaglandins	Beneficial for migraines linked to menstrual cycles	(Shaik and Gan, 2015)
Vitamin D	Lowers levels of calcitonin gene-related peptide (CGRP)	Reduces headache days and improves quality of life	(Shaik and Gan, 2015)
Vitamin C	Neutralizes reactive oxygen species as an antioxidant	Helps to manage neurogenic inflammation	(Shaik and Gan, 2015)
Magnesium	At doses of 400-600 mg daily, improves brain metabolism	Safe in alleviating migraine symptoms	(Demarquay et al., 2021; Haghdoost and Togha, 2022)

Omega-3 fatty acids

Another meta-analysis on supplementation offered promising results when it comes to migraine management. Omega-3 fatty acids supplementation, particularly EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), showed efficacy comparable to FDA

(Food and Drug Administration)-approved pharmacological treatments in reducing both the frequency and severity of migraines. Not only did it have similar acceptability and lower frequency of adverse events, but it also had a superior prophylactic effect. Omega-3 fatty acids modulate pathways in migraine pathophysiology. They reduce the expression of tumor necrosis factor α (TNF-α), cyclooxygenase-2/NO synthase induction, and IL-1β concentrations, decreasing neuroinflammation.

Additionally, the EPA and DHA decrease nociceptive responses in the opioid system and restore serotonin and dopamine concentrations in the TVGT (trigeminal nerve-trigeminocervical complex-ventroposteromedial thalamic nucleus cascade) nociceptive pathway (Tseng et al., 2024). As suggested in the literature, reducing omega-6 and increasing omega-3 fatty acid consumption seems to demonstrate benefits in migraine treatment (Razegh-Jahromi et al., 2019; Gazerani, 2020; Spekker and Nagy-Grócz, 2023). Collectively, the discussed supplements, due to their impact on migraine pathophysiology, represent promising alternatives to conventional migraine therapies. However, further research is needed to identify patient-specific benefits, safety, and possible interactions (Demarquay et al., 2021; Shaik and Gan, 2015; Haghdoost and Togha, 2022).

Specific Diets

All in all, specific diets should not be recommended as there is too little evidence to make particular recommendations (Demarquay et al., 2021). However, various diets have been tested in migraine management and show promise in improving migraine symptoms. Dietary interventions affecting specific metabolic and inflammatory pathways offer innovative approaches to treat and prevent migraine.

Ketogenic diet

The ketogenic diet involves a high-fat and very low-carbohydrate intake. It showed promise to be beneficial in migraine (Razeghi-Jahromi et al., 2019). It induces a state of ketosis in the organism by increasing the level of ketone bodies, which serve as an alternative energy source. It improves abnormal glucose metabolism commonly observed in migraine patients (Gazerani, 2021). It seems to have a neuroprotective effect and enhance mitochondrial function (Razeghi-Jahromi et al., 2019; Spekker and Nagy-Grócz, 2023; Gazerani, 2021). Like fasting, which also elevates ketone body levels, the ketogenic diet helps reduce oxidative stress, decrease cortical excitability, and lower inflammation (Razeghi-Jahromi et al., 2019; Gazerani, 2021).

Research has shown significant reductions in migraine frequency, duration, and severity, as well as decreased reliance on medication among individuals adhering to the ketogenic diet (Razeghi-Jahromi et al., 2019; Spekker and Nagy-Grócz, 2023; Nguyen and Schytz, 2024). However, the ketogenic diet is not without risks. Prolonged ketosis has been linked to adverse outcomes, including elevated cardiovascular risks in older adults and potential life span shortening, as suggested by animal studies on mice (Fila et al., 2023). Due to its properties, the ketogenic diet makes it a promising option for individuals with migraines. However, further research is needed to establish the long-term safety and efficacy of the diet in diverse patient populations to make any recommendations (Demarquay et al., 2021; Fila et al., 2023).

Low-glycemic diet

The low-glycemic diet (LGD), which limits the intake of high-GI (glycemic index) foods, has demonstrated potential in managing migraine symptoms (Razeghi-Jahromi et al., 2019). Limiting daily carbohydrate intake to 40–60 g with a glycemic index below 50 stabilizes blood sugar levels and alleviates migraine triggers associated with glucose fluctuations (Razeghi-Jahromi et al., 2019). The diet, in which carbohydrates come mainly from vegetables, fruits, and high-fiber products, has demonstrated good tolerability and low adverse events (Razeghi-Jahromi et al., 2019). A conducted randomized controlled trial has provided evidence to prove its efficacy: Migraine patients adhering to an LGD experienced significant reductions in attack frequency and headache intensity after just one month, with further improvements noted after three months (Razeghi-Jahromi et al., 2019).

Additionally, the diet's anti-inflammatory properties, evidenced by reductions in soluble TNF-α receptors and CRP levels, may contribute to its benefits in reducing migraine symptoms (Razeghi Jahromi et al., 2023). Stabilizing blood glucose levels may benefit gut health involved in the gut-brain axis, another factor of migraine pathophysiology (Haghdoost and Togha, 2022). Again, despite these promising findings, further randomized controlled trials are necessary to establish the long-term safety, efficacy, and optimal implementation of LGD in migraine management (Razeghi-Jahromi et al., 2019).

Low-fat diet

A recent review identified the low-fat diet incorporation as an intervention potentially beneficial in the management of migraines (Gazerani, 2020). Specifically, a study combining a low-fat vegan diet with an elimination diet (which will be discussed later in this article) observed significant reductions in attack duration, frequency, severity, and the percentage of drug intake in headaches, showing the diet's potential in migraine management (Nguyen and Schytz, 2024). Low fat diets' impact on lipid metabolism and platelet aggregation probably explains their efficacy in migraine management.

High-fat diets elevate plasma LDL-cholesterol levels and increase platelet aggregation, which can trigger migraines. Serotonin secretion and its downstream effects on blood vessels, nitric oxide (NO), and prostaglandin (PG) production combined with hypercoagulation can provoke a migraine attack (Razeghi-Jahromi et al., 2019). By contrast, low-fat diets may modulate plasma lipid profiles, reducing platelet aggregation and stabilizing serotonin metabolism, decreasing the frequency and duration of migraine attacks (Razeghi-Jahromi et al., 2019).

The DASH (Dietary approach to stop hypertension) diet

Blood pressure has been reported to have a negative relationship with headache occurrence, hence it seems justified to incorporate dietary strategies managing hypertension to migraine treatment (Razeghi-Jahromi et al., 2019). The DASH diet, created to lower blood pressure, has been reported to have advantages in migraine and to decrease the intensity of pain and duration (Gazerani, 2023; Smith et al., 2019; Spekker and Nagy-Grócz, 2023; Gazerani, 2021; Nguyen and Schytz, 2024).

By emphasizing the consumption of fruits, vegetables, and whole-grain foods while minimizing sodium, saturated fats, and sweets intake, the DASH diet improves outcomes on tools measuring the frequency and severity of attacks and the duration of pain, such as Migraine Index, Migraine Headache Index Score or Headache Diary Result (Spekker and Nagy-Grócz, 2023). Another study comparing the 12-week DASH diet administration to the control group reported a reduction in attack duration, frequency, and pain intensity (Nguyen and Schytz, 2024). DASH, according to current research, can be beneficial for migraineurs suffering from hypertension. However, researchers need to conduct more studies to recommend this diet to a broader group of patients (Razeghi-Jahromi et al., 2019).

Mediterranean Diet

Studies also mention the Mediterranean diet, which consists of vegetables, fruits, olive oil and nuts intake, and limited animal meat consumption. It offers similar benefits in migraine management to the DASH diet and requires further research to establish its efficacy (Razeghi-Jahromi et al., 2019; Spekker and Nagy-Grócz, 2023).

Epigenetic Diets

Emerging concepts, like epigenetic diets, focus on dietary components altering mechanisms in migraine (and other diseases) pathophysiology on cellular and molecular levels (Gazerani, 2020). This approach targets DNA methylation, which, when aberrant, can be one of the migraine causes (Gazerani, 2020; Spekker and Nagy-Grócz, 2023). Accordingly, a folate-rich diet has been under investigation because of its role in mitochondrial mechanisms (Gazerani, 2020; Spekker and Nagy-Grócz, 2023).

Similarly to folate, riboflavin or, previously mentioned in the article, vitamin B2 are factors that play a role in mitochondrial function and may be a target in further research in epigenetic diets (Spekker and Nagy-Grócz, 2023). Although promising, the concept of an epigenetic diet remains theoretical, and further studies are required to confirm its efficacy in clinical practice and to identify the specific dietary compounds most effective for migraine prevention (Gazerani, 2020; Spekker and Nagy-Grócz, 2023).

Elimination of dietary triggers

Another approach is to incorporate elimination diets, which aim to identify and exclude specific dietary triggers that may provoke migraine attacks (Gazerani, 2020). There is a wide variety of foods or ingredients mentioned in the literature. Common triggers include chocolate, citrus fruits, avocados, some vegetables like onions or tomatoes, dairy products like aged cheeses, alcohol, caffeine, tea and coffee, processed foods, monosodium glutamate (MSG), histamine, tyramine, foods containing nitrates such as bacon, ham or smoked fish, phenylethylamine, artificial sweeteners like aspartame, sucralose, gluten, and a lot more (Gazerani, 2023; Razeghi-Jahromi et al., 2019; Gazerani, 2020; Spekker and Nagy-Grócz, 2023; Haghdoost and Togha, 2022).

Triggers vary among individuals, and their effects are influenced by factors such as genetic predisposition, exposure time, pathomechanisms, or dosage, highlighting the importance of personalized dietary strategies (Gazerani, 2023; Gazerani, 2020; Spekker and Nagy-Grócz, 2023). For example, caffeine can both prevent and provoke migraine attacks. It is an efficient painkiller, but when withdrawn, it can cause an attack (Spekker and Nagy-Grócz, 2023; Haghdoost and Togha, 2022). Chocolate-triggered attacks' pathomechanism remains uncertain but is attributed to vasodilatation by flavanols stimulating endothelial nitric oxide synthase (eNOS) activity or content of 5-HT and its precursor tryptophan, which increased levels may provoke attacks (Spekker and Nagy-Grócz, 2023).

Elimination diets have shown promise in conducted studies. Randomized trials have reported reductions in attack frequency, severity, and medication use following the elimination of IgG-positive foods (Gazerani, 2021). Another study observed a 19% reduction in headache days after just four weeks of an elimination diet incorporation (Gazerani, 2021). The diet reduces attack duration, frequency, severity, and medication intake (Nguyen and Schytz, 2024). Researchers emphasize the nonlinearity of dietary triggers provoking migraine attacks as a specific ingredient may cause an attack, but not after each consumption or an even time exposure (Gazerani, 2020).

Even though food diaries used in identifying the triggers seem to prove useful in clinical practice and identification of potential triggers, it is essential to pay attention to their sometimes-misleading outcomes and to personalize a diet to a specific patient (Gazerani, 2023; Gazerani, 2020; Spekker and Nagy-Grócz, 2023; Haghdoost and Togha, 2022). Despite encouraging findings, elimination diets have insufficient evidence and require further research to establish their long-term efficacy and safety in migraine management (Moskatel and Zhang, 2022; Hindiyeh et al., 2020; Nguyen and Schytz, 2024). Meanwhile, digital tools, such as electronic food diaries and artificial intelligence, offer innovative solutions for tracking dietary patterns and identifying triggers (Spekker and Nagy-Grócz, 2023; Gazerani, 2021).

Gut Health and Probiotics

Migraine, among other neurological disorders, is associated with various gastrointestinal (GI) diseases, for example, inflammatory bowel disease, celiac disease, Helicobacter pylori infection, or irritable bowel syndrome, and can often be accompanied by GI symptoms such as nausea, vomiting, and bowel disturbances (Gazerani, 2020; Arzani et al., 2020). The relationship between gut health and migraine has become a significant research subject. The gut-brain axis is a bidirectional pathway connecting the GI system and the central nervous system (Arzani et al., 2020; Gazerani, 2021). It appears to be influenced by inflammatory mediators (e.g., IL-1β, IL-6, IL-8, TNF-α), neuropeptides, serotonin pathways, stress hormones, and nutritional substances, all of which may contribute to migraine pathophysiology (Arzani et al., 2020).

A study proved alterations in gut microbiota composition or dysbiosis to have a link to migraines (Gazerani, 2021). For instance, an unhealthy gut microbiota composition, such as one with a higher concentration of *Clostridium* species, was observed in migraineurs. In contrast, a healthier composition of bacterial species like *Faecalibacterium prausnitzii* and *Bifidobacterium adolescentis* were more prevalent in control patients (Gazerani, 2021). Thus, correcting dysbiosis with probiotics may become a new migraine treatment strategy (Gazerani, 2021). Findings suggest that probiotic supplementation could reduce neuroinflammation, which takes part in migraine pathomechanism (Gazerani, 2021), and alleviate migraine symptoms by reducing the frequency and severity of the attacks (Nguyen and Schytz, 2024).

Moreover, researchers found that using probiotics decreased the amount of drugs administered by patients (Spekker and Nagy-Grócz, 2023; Gazerani, 2021). Studies on probiotic supplementation involving strains like *Lactobacillus* and *Bifidobacterium* have shown reductions in attack frequency and severity in both episodic and chronic migraine patients (Spekker and Nagy-Grócz, 2023). Another study proved that probiotics administration increased the quality of life of 80% of participants (Gazerani, 2021). Furthermore, dietary strategies targeting gut health, such as low-glycemic diets, an increased fiber intake, and supplementation with omega-3 fatty acids and vitamin D, low-fat vegan diets, gluten-free diets, or weight-loss diets may promote a healthier gut microbiota and improve migraine outcomes (Gazerani, 2020; Spekker and Nagy-Grócz, 2023; Arzani et al., 2020).

4. CONCLUSION

Dietary and physical interventions are promising non-pharmacological approaches in migraine management. They modulate various psychological and metabolic mechanisms of the condition. The evidence supports the potential benefits of physical interventions, such as exercise, physical therapy, manipulative interventions, and dietary ones, such as ketogenic, low-glycemic, low-fat diets, supplementation of omega-3 fatty acids, vitamins, and probiotics. They target the migraine pathophysiology factors, which include nociceptive pathways, neuroinflammation, mitochondrial dysfunction, or the gut-brain axis disorder, resulting in a decrease in migraine attacks' frequency, severity, and duration. Personalized dietary plans, adjusted to specific needs and individual triggers of patients, may improve treatment outcomes. However, most of these strategies require further research to establish their long-term safety and efficacy to provide patients with effective and more acceptable options for migraine management.

Authors' Contribution

Gabriela Skurzyńska: Conceptualization, writing - rough preparation, investigation
Aleksandra Krzowska: Formal analysis, supervision
Zuzanna Bałoniak: Writing - rough preparation, data curation
Agnieszka Leszyńska: Conceptualization, data curation
Julia Bałoniak: Methodology, project administration
Michalina Doligalska: Conceptualization, methodology,
Aleksandra Stremel: Resources, writing- rough preparation
Aleksandra Jonkisz: Writing - Review and editing, supervision
All authors have read and agreed with the published version of the manuscript.

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Informed consent

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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