Mini Review
Sciences of Phytochemistry

Could Ginger Extract Be a Therapeutic Drug for Migraine?

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[The author informations are in the declarations section. This article is published by ETFLIN in Sciences of Phytochemistry, Volume 2, Issue 1, 2023, Page 60-65. https://doi.org/10.58920/sciphy02010075]

Received: 14 April 2023
Revised: 30 April 2023
Accepted: 12 May 2023
Published: 12 May 2023

Editor: James H. Zothantluanga

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Keywords: Ginger, Headache, Ketoprofen, Migraine, Sumatriptan, Zingiber officinale.

Abstract: Migraine is a common neurological disorder that may be accompanied by vascular disturbances, Migraine is one of the most causes of disability worldwide. *Zingiber officinale* is a medicinal herb that has an analgesic effect on many disorders such as headaches, migraine, muscle tension, stomach spasm, and dysmenorrhea. Also, ginger has many pharmacological actions used to treat and prevent various common symptoms and diseases. This review aims to evaluate the potential of ginger to treat or prevent migraine episodes. Especially nowadays, patients prefer herbal and complementary medicine to avoid the hard side effects of chemical drugs. The author searched several databases including PubMed, Science Direct, Wiley Online, and Scopus through February 2023 for recent articles with good quality evaluating the potential of ginger to treat migraine patients. The author made investigations and Interpretations depending on the results of the authors' experiments in previous articles included in my review. It is suggested that the bioactive compounds in ginger have the potential to treat and prevent acute migraine episodes effectively and safely. The author recommends encouraging the manufacturing of different pharmaceutical dosage forms of ginger extract to be used worldwide in a safe way and to render a higher absorption rate, and pharmacological response.

Introduction

Migraine is considered a neurological disorder. It may be accompanied by visual, gastrointestinal, and/or premenstrual disturbances (1). It is a significant contributor to disability and lowers people's quality of life globally (2-6). According to estimates, migraines cause 45 million years of impairment to be lived globally, with a prevalence of 8 to 18% (7-14). Prophylaxis and effective treatment can decrease migraine attacks' severity and frequency (15). There are several classes of drugs commonly used for migraine treatment, such as beta-blockers, calcium channel blockers, tricyclic antidepressants, selective serotonin reuptake inhibitors, anti-epileptic drugs, triptans, ergot alkaloids, and non-steroidal anti-inflammatory drugs that may cause various side effects and are prescribed with caution for a limited duration (16). Due to their unhappiness with traditional therapy and associated adverse effects, many patients prefer nonchemical (herbal) or easily accessible over-the-counter (OTC) medications to treat their headaches (17, 18). Southeast Asia is home to the popular medicinal plant ginger. Dehydrated zingiber rhizomes include 40–60% carbohydrates, 10% protein, 10% fat, 5% fibre, 6% minerals, 10% water, 1% essential oil, and 5%–8% resin and mucilage (19-21). The volatile and non-volatile compounds found in ginger rhizomes are numerous. The ginger's flavour comes from volatile compounds, which make up a small portion of the ginger rhizome. The primary bioactive compounds are non-volatile, which include shogaols and gingerols. These bioactive compounds can be found in ginger extracts (22). Ginger has analgesic and anti-inflammatory effects so that it could relieve pain (23, 24).

Ginger Effects on Migraine Patients

Administration of 400 mg of ginger extract greatly reduced pain in acute migraine patients (25). In a previous study performed by Cady et al. (2005) Gelstat

(an OTC drug that contains ginger extract) improved migraine headaches within 2 hours of administration of the drug (26). In a previous case report, a 42-year-old woman with a 16-year history of migraine achieved headache relief within 30 minutes of administration of a 500–600 mg water-soluble ginger powder till the onset of visual aura. Patients, who continued consumption of ginger powder, every 4 hours for four days, reported both diminished headache severity and frequency (21). A randomized, double-blind, placebo-controlled trial (n = 100) comparing the efficacy of ginger and sumatriptan in treating migraine without aura found the 2 agents equally effective. Patients who took sumatriptan (50 mg) or ginger (250 mg ginger rhizome powder) within two hours of taking it reported at least a 90% reduction in headache intensity (27). In a randomized controlled trial, patients taking a sublingual product containing feverfew (another medicinal herb) and ginger at the earliest recognition of migraine twice daily were free of pain at two hours compared to patients taking a placebo (P = .02) (28). Patients who reported migraine episodes and administered 400 mg of ginger extract divided into two capsules (containing 20 mg (5%) of active gingerols), and an intravenous drug of 100 mg ketoprofen resulted in a pain decrease and the functional capacity was improved (29). Administration of 500 mg of ginger powder three times a day for 2 days before the onset of the menstrual period and continued for the first three days of the menstrual period was reported to be effective to decrease the severity of dysmenorrhea-related pain (30). Chen & Cai. (2021) have confirmed the effect of ginger to reduce migraine-induced nausea and vomiting. Ginger showed antiemetic properties and improved nausea and vomiting induced by chemotherapy, post-operative, or during pregnancy (30-34). Ginger has a lot of pharmacological actions that greatly contribute to the improvement of migraine symptoms.

Methodology for Review

The author searched a lot of databases including PubMed, Wiley Online, Scopus, and Science Direct through February 2023 for articles with good quality evaluating the potential of ginger in the treatment of migraine patients with the following keywords: “migraine”, and “ginger” or “Zingiber” (see **Figure 1**). The reference lists of papers were also hand-searched, and the author has performed the process above repeatedly to include additional better studies. He made investigations and Interpretations depending on the results of the authors' experiments in previous articles included in my review. Finally, He has used Microsoft Office Excel software to design the following charts that classify the number and type of included articles each year. It is noted that there are few clinical trials and randomized controlled studies evaluating the potential of ginger for treating migraine, however, we can see a kind of evolution of research in this field compared to the past (see **Figure 1** and **2**).

Effect of Ginger Extract on Biomarkers

The release of inflammatory mediators such as prostaglandins, cytokines, and bradykinin due to the release of neuropeptides that activate trigeminal nerve fibers activate nociceptive pathways during migraine attacks (35, 36). Drugs used in pain treatment usually act by altering the transduction and/or modulation of nociception (37). Symptoms associated with migraine attacks can be activated by nociceptive signals, therefore, the blocking of nociceptive pathways may improve these symptoms (38). The analgesic action of ginger is due to its active components; gingerols and shogaols that inhibit arachidonic acid metabolism via decreasing the expression of cyclooxygenase-2 enzyme (COX-2), leading to inhibition of prostaglandin biosynthesis like the non-steroidal anti-inflammatory drugs (39, 40). Ginger blocks lipoxygenase (LOX), another enzyme in the arachidonic acid pathway (41). The concomitant inhibition of COX and LOX may increase anti-inflammatory action and reduce its side effects (42).

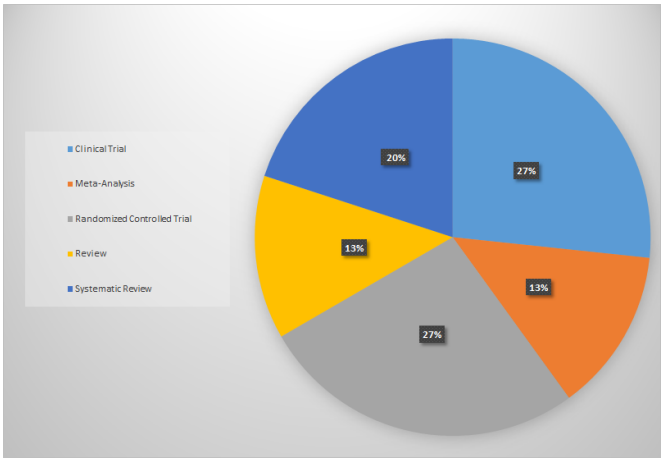


Figure 1. Types of collected articles only evaluate the potential of ginger to treat migraine.

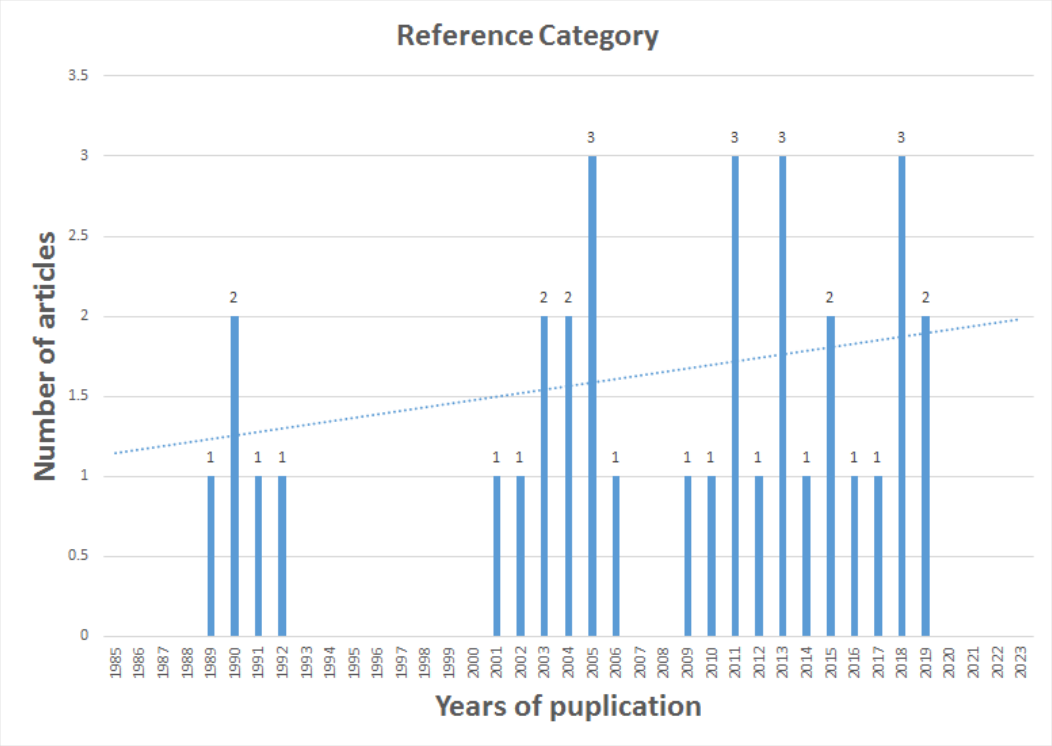


Figure 2. The included studies' distribution only evaluates ginger's potential to treat migraine each year.

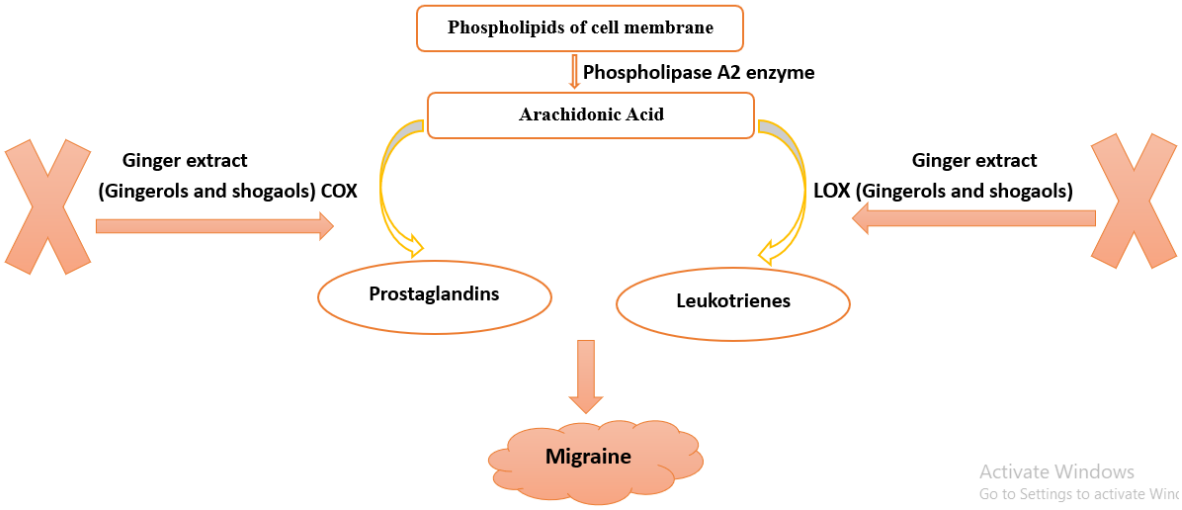


Figure 3. Ginger extract role in the treatment of migraine episodes.

Furthermore, shogaols modulate neuroinflammatory pathways via the downregulation of inflammatory spots on existing microglial cells that regulate brain development, maintenance of neuronal networks, and injury repair and serve as brain macrophages as they are responsible for the elimination of microbes, dead cells, redundant synapses, protein aggregates, and other particulate and soluble antigens that may endanger the CNS (43). While gingerols may act as agonists of the capsaicin-activated vanilloid receptors that evoke capsaicin-like intracellular Ca2+ transients and ion currents (44). All these various mechanisms of ginger render more benefits to improve migraine (**Figure 3**).

Conclusions

Considering the above, powdered, or fresh ginger has the potential to treat acute migraine patients, but with some limitations (45). Using ginger as an add-on therapy to NSAIDs renders more benefits not only for treatment but also for prophylaxis (29). It is suggested that 250 mg of ginger rhizome powder is clinically effective and safe to treat migraine headaches (27). In patients administering ginger, some side effects were

observed such as heartburn, headaches, and vertigo, especially if taken in large doses (46, 47). The author pays attention that ginger should not be used as a replacement for prescribed medication without consulting a healthcare professional.

Declarations

Author Informations

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Contribution: Conceptualization, Data Curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - Original Draft, Writing - Review & Editing.

Acknowledgment

There is a lot I need to thank God for, every day. But I think I am blessed because I have a very loving, understanding and supporting family. The author is grateful to his mother, Mona, his father, Abd El-Moniem, his brothers, Mohamed, Mahmoud, and Omar, his sister, Menna, and his best friends. The author expresses his gratitude to all his professors and teachers. The author declares that there are some limitations as the appropriate dose, and pharmaceutical dosage form of ginger for treating migraine needs to be established through well-designed clinical trials on a large scale for relatively long follow-up periods to determine the optimal dosage, duration of treatment, and potential side effects of ginger in treating migraine.

Conflict of Interest

The author declares no conflicting interest.

Data Availability

The unpublished data is available upon request to the corresponding author.

Ethics Statement

Not applicable.

Funding Information

Not applicable.

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How to cite: Amer, A.A.. Could Ginger Extract Be a Therapeutic Drug for Migraine?. Sciences of Phytochemistry. 2023; 2(1):60-65