

Yoga as an Effective Approach for Primary Headache Management

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Abstract

Primary headache and Migraine are common conditions in every society and are the 6th leading cause of disability worldwide, affecting approximately 12% of Americans and millions worldwide, resulting in an inability to attend work or school for at least 1 day every 3 months. Numerous pharmacological options exist for headaches treatment, but these therapies come at high cost and carry numerous potential adverse effects. Yoga is an ancient Indian non-religious technique that is known to aid in treatments of chronic conditions such as stress, anxiety, depression, hypertension and diabetes, and have a substantial effect on reducing headache burden. Research studies have been conducted to demonstrate the effectiveness of yoga lifestyle modifications and exercise on chronic pain syndromes, specifically in primary headache and migraine. Yoga was shown to improves quality of life, reduce headache intensity and headache frequency, when used alone or as an adjuvant to conventional therapy and show a significant decrease in headache frequency and intensity along with a reduction in the use of symptomatic medication. Yoga, being a slow non-exertional aerobic exercise, enhances mood and alleviates stress and depression in adults and invaluable treatment alternative in the pediatric population, where it can create a sustainable healthy lifestyle.

**Keywords:** Complementary therapy • Yoga • Headache • Migraine

**Abbreviations:** MBSR: Mindfulness Based Stress Reduction; CTTH: Chronic Tension Type Headache CAM: Complementary and Alternative Medicine

Introduction

Headache is one of the most common symptoms observed by healthcare professionals in their day-to-day clinical practice and the biggest contributor, affecting approximately 12% of Americans and millions worldwide [1]. It has been shown to be a main reason for decreased work or school productivity by 50% in almost half of affected individuals during an attack and thus has a significant impact on overall well-being and quality of life [2] and can result in an inability to attend work or school for at least 1 day every 3 months [3]. In the USA alone, migraine contributes to 86.5 million lost workdays each year and to an indirect annual cost of \$9.3 billion [4]. Headache can be a secondary symptom of many neurological disorders as well as a primary disease and a risk factor for stroke, hypertension, diabetes, asthma and obesity [5]. It includes migraine headache, tension headache and trigeminal autonomic cephalalgias such as cluster headache and characterized as a recurrent disabling headache, pulsating or throbbing in quality, and moderate to severe in intensity. Migraines are often accompanied by photophobia, phonophobia, nausea, vomiting, and aggravated by routine physical exercise [6] and is classified into two categories: episodic migraine and chronic migraine. Chronic migraine is defined as 15 headache days per month with 8 days per month that meets the criteria for migraine and/or when a migraine medication such as a triptan is used for more than three months [7]. Episodic migraine is defined

as 14 or less headache days per month [8]. Tension headaches are reported as recurrent episodes of headache which are typically pressing or tightening in quality, of mild to moderate intensity, bilateral in location and do not worsen with routine physical activity [9]. Globally, more than three billion people are estimated to be suffering from migraine and tension headache estimated to account for 11.2% of YLDs (years lived with disability) [10,11]. Prevalence is higher in females than in male with a changing ratio of 2:1 to 3:1, especially between the ages of 25 and 55 years [12]. For migraine, reported global age-standardized prevalence in 2016 was 14.4% (13.8-15.0) overall: 18.9% (18.1-19.7) for women, and 9.8% (9.4-10.2) for men (Table 1). Worldwide, at any given time, it is approximated that 47% of adults have an active headache, 10% have a migraine, 38% have tension-type headache and 3% have a chronic headache. In the USA, headaches are the leading cause of outpatient visits to emergency department [13].

Ayurveda

A holistic healing system developed more than 3,000 years ago in India and based on the belief that health and wellness depend on a delicate balance between the mind, body, and spirit. Ayurveda places great emphasis on prevention and encourages the maintenance of health through close attention to balance in one's life, right thinking, diet, lifestyle and the use of herbs.

The wide prevalence of headaches creates a burden not only on individuals, but also to society as a whole, with significant socioeconomic outcome. Headache management is traditionally based on pharmacological therapies. However, only about half of migraineurs show clinically positive responses to medications. The management of headache includes pharmacologic treatment

Table 1. Global prevalence: Types of headaches.

Headache	Total global Prevalence (%)	Woman Prevalence (%)	Mean Prevalence (%)
Tension-type Headache	26,1	30,8	21,4
Migraine	14,4	18,9	9,8

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used as abortive treatment and for prevention. These drugs carry the risk of substantial adverse effects along with issues of compliance and adherence in the long-term. As example, regular use of analgesics for headache relief can have an adverse effect of paradoxically causing a headache. There are two ways in which an individual can increase their risk of developing a headache-related medication overuse: Either by using NSAIDs for at least half a month or by using a combination of analgesics, opioids, ergotamine's or triptans for one third of a month or more. Lifestyle adjustment, such as yoga, can decrease the burden on headaches. The National Institute of Health defines complementary and alternative medicine/treatment as a group of diverse medical and health care systems, practices, and products that are not included in conventional medicine [14]. Hence, alternative treatments are commonly used in addition to the conventional treatments, although patients with migraine do not use alternative treatments alone [15].

Yoga is an ancient Indian non-religious technique that combines both physical postures and breathing exercises known to decrease chronic pain syndromes by relieving stress. It may be implemented as an adjunctive approach in addition to pharmacologic therapy and other lifestyle modifications. Yoga has been shown to be effective in prevention and treatment multiple chronic conditions such as stress, anxiety, depression, hypertension and diabetes and is known to have a substantial effect on reducing headache burden. [3] Yoga can provide many different physiological benefits. It has the ability to change heart rate, respiratory rate, fasting blood glucose, and blood pressure [16]. For example, yoga can increase vagal tone while reducing sympathetic activity. The potential of yoga to increase vagal activity elucidates some of its health benefits [17].

In a 2016 national health survey in the USA, it was found that 21 million Americans practiced yoga in the past year. Americans reported practicing yoga for three main reasons: to increase energy, to improve their immune system and to prevent disease. The three major health conditions Americans reported included back pain, arthritis, and stress. Yoga can be implemented as a sustainable therapy for chronic pain syndromes and as an important non-conventional treatment that has been shown to reduce chronic pain, stress, and other risk factors of headache such as psychiatric conditions and obesity. In yoga theory, migraine is considered as an *Adhijavyadhi*, a mind-body disorder, where the disturbances in the mind influence the flow of *Prana*, which is the vital force/breath, resulting in physical problems and affecting the weakest system in the body [18]. Yoga can be practiced as a mind-body intervention on a daily basis that incorporates various stretching, breathing exercises, and asanas/postures, to create relaxation known as *Shavasana* [19]. The aim of this review is to provide comprehensive evidence for the practice of yoga as a more beneficial treatment modality for headaches than current pharmacologic treatment.

## Literature Review

Journal articles were reviewed by using a PubMed search of the past 15 years for all studies pertaining to yoga as a treatment for headache. Attention was made to look for articles explaining how yoga can be used as a treatment for different types of headaches such as migraine and chronic tension type headaches, specifically the duration and frequency of yoga that was used and a description of the results, demonstrating the potential effects that yoga could have for patients. The review was analyzed by the number of subjects and implementation of yoga or complementary alternative medicine (which included yoga) as a treatment for headache. Articles that used yoga combined with alternative treatments along with pharmacological medications was not excluded, rather, purposely included showing how yoga could be used in conjunction with other medical treatments. Controlled prospective non-randomized, cross-sectional, and comparative studies were included along with randomized control studies. The reviewed articles were not standardized by the number of patients nor by the populations from which patients were selected, which range from 19 patients to 23,393 patients.

### Yoga as remedy for headache in evidence-based literature

There are several research studies that scientifically support the use of

yoga to improve the quality of life of people with headaches [20]. Combined use of Ayurveda and yoga has been shown to significantly reduce migraine and stress. Specifically, for episodic migraine, studies have demonstrated that the application of integrative medicine, including yoga among other therapies, reduces overall stress level as well as headache frequency [21]. A 90-day study by Sharma et al. recruited 30 subjects in an Ayurveda and yoga group compared to 30 control subjects who received NSAID's to determine if Ayurveda and yoga could decrease symptomatology associated with headaches. The study showed yoga to significantly reduce pain intensity and improve the quality of life in patients with migraine. Specifically, the study was able to show that traditional Ayurveda along with yoga therapy decreased migraine symptoms [20]. Kisan et al. showed a similar reduction in pain intensity and demonstrated an improvement in vagal tone and reduction of sympathetic activity in such patients. Another study by Wells et al. showed reduction in migraine attacks after 8 weeks of mindfulness-based stress reduction, with decreased medication use in all groups, although the sample size was too small to detect a statistically significant affect. The decreased use of medication led the authors to suggest an alternative medicine can help treat headaches by increasing tolerance to pain. Moreover, it has been shown that meditation, in addition to conventional care, was able to significantly relieve severity, duration, and frequency of headaches [22]. A study performed in female migraineurs assessed the effect of 12 weeks yoga training of headaches and they found that the frequency, duration and intensity of headaches was significantly decreased (Table 2).

In an open labeled, non-randomized, ninety-day study by Vasudha et al., thirty subjects were recruited to an Ayurveda and Yoga group in comparison to thirty subjects in a control group who continued to take Non-Steroidal Anti-Inflammatory Drugs (NSAID's). This study assessed perceived stress, heart rate variability, muscle tension, and migraine disability. Using these measures, the study determined a significant reduction in migraine disability and perceived stress, in the Ayurveda and Yoga group and it was able to determine that the Ayurveda and Yoga group had decreased frontalis muscle activity (a proxy for muscle tension) and improved sympathovagal balance compared to the control group [23]. Patients with chronic tension type headaches suffer from temporalis muscle over activity. In a study by Bhatia et al. individuals who used yoga had decreased amplitude measured by an EMG of the temporalis muscle which indicates the potential of yoga as a treatment modality for chronic tension type headaches [24]. In a review by Wahbeh et al. it was concluded that there is significant advantage in using mind-body techniques as a treatment modality for migraine headaches [25]. Furthermore, they noted that chronic tension and mixed type headaches could also benefit from mind-body techniques.

Treatment approaches for stress related headache are invariably focused on improving lifestyle with recommendations including avoidance of triggers, healthy diet, sleep, and exercise, such as yoga [26]. A study carried out on a pediatric population by Dalla Libera et al., used alternative therapies, including yoga, as a preventive treatment for migraines, and was able to avoid the use of pharmacological medications [27]. Another study that evaluated the effect of yoga over 8 weeks as a treatment for chronic headaches, showed favorable results, in terms of improved daily functioning and quality of life [28]. In the systematic review by Rastogi et al. it was determined that children often require changes in lifestyle or other alternative treatments in order to have significant improvement in their headaches and suggested a migraines-lifestyle management approach, acronym SEEDS: Sleep properly, Exercise regularly, Eat healthy, Drink water, and Stress management [29]. Therefore, yoga could become an invaluable treatment alternative in the paediatric population as it can create a sustainable lifestyle, showing the need for conducting further studies on yoga and headaches as a potential treatment modality in the paediatric population. In a review where six randomized controlled trials were analysed investigating the effect of yoga on headaches, yoga exercise resulted in a significant reduction in headache intensity, frequency and in anxiety and depression. In particular, one randomized controlled trial compared the effect of yoga as a treatment for headaches, showing that there was a significant decrease in headache frequency and intensity along with a reduction in symptomatic medication used. This trial implemented yoga poses and breathing techniques to manage headaches and even though both groups received medication, the yoga group had significantly reduced frequency and intensity

Table 2. Review of clinical studies on yoga and headache.

Author	Study Design	Population	Duration and Frequency of Yoga	Outcome / Results
Michalsen et al. [35]	Controlled prospective non-randomized study	N=24 24 female participants (mean age 37.9+/-7.3 years) self-referred themselves for emotional distress. Participants were offered to partake in one of two 3-month yoga programs. Group 1 (n=16) participated in the first class, group 2 (n=8) served as a waiting list control.	3 months Participants attended two-weekly 90-min Iyengar yoga classes.	Subjects who participated in the yoga showed significant improvements in perceived stress (P<0.02), State and Trait Anxiety (P<0.02 and P<0.01, respectively), well-being (P<0.01), vigor (P<0.02), fatigue (P<0.02) and depression (P<0.05). Physical well-being also increased (P<0.01), and those subjects suffering from headache or back pain reported marked pain relief.
Rossi et al. [15]	Cross-Sectional Study	N = 481 481 migraine sufferers attending a headache clinic were asked to undergo a physician-administered structured interview designed to gather information on CAM use [15].		Complementary and alternative medicine (CAM) therapies were perceived to be beneficial by 39.5% of the patients who had used them. Migraine patients reported CAM treatments to be ineffective compared to episodic migraine patients (73.1% vs. 50.7%, P<0.001). Patients reported they most commonly resorted to CAM to try to improve their headache (47.7%) [15].
Bhatia et al. [24]		N = 22 15 patients with CTTH and 7 age matched controls [24].	The temporalis muscle was recorded for one minute each during rest, mental activity and maximal voluntary contraction and subjective pain scoring was done by visual analogue scale [24].	After different interventions of NSAID's, botulinum toxin injections and yoga practice, EMG records showed a reduction in the mean EMG amplitude of the temporalis muscle during rest and mental activity more significantly after yoga practice (P=0.03) and subjective pain scores decreased from 7.00 +/- 2.10 to 2.00 +/- 1.26 (P=0.02) supporting the beneficial effect of such non-invasive techniques.
John et al. [36]	Randomized Controlled Trial	N = 72 72 patients with migraine without aura were randomly assigned to yoga therapy or self-care group.	3 months	Subjects' complaints related to headache intensity, frequency, pain rating index, affective pain rating index, total pain rating index, anxiety and depression scores, and symptomatic medication use were significantly (P<0.001) lower in the yoga group compared to the self-care group.
Wells et al. [14]	Comparative Study	N = 23,393 This study compared Complementary And Alternative Medicine (CAM) use between adults with and without self-reported migraines/severe headaches using the 2007 National Health Interview Survey (n=23,393), a national cross-sectional survey [14].		Adults with migraines/severe headaches used CAM more frequently than those without (49.5% vs 33.9%, P< .0001). The most commonly used alternative treatments were deep breathing exercises, meditation and yoga. A small percentage (4.5%) of adults with migraines/severe headache reported using CAM to specifically treat their migraines/severe headaches [14].
Hainsworth et al. [28]	Clinical Trial	Pediatric	8 weekly, 75-minute classes [28]	Scores on the majority of outcome measures (headache frequency, and severity of migraine) changed in the predicted direction with medium effect sizes found. Pain measures did not change significantly [28].
Göksel et al. [30]		N = 110 110 primary headache patients attending three headache clinics completed a questionnaire regarding their headaches and the use and effect of CAM procedures for their headaches [30].		The most common types of CAM treatments were found to be massage (74.5%), acupuncture (44.5%), yoga (31.8%), exercise (28.2%), psychotherapy (25.5%), and rosemary (23.6%). Massage was the only alternative found to be beneficial in one-third of the primary headache patients; and the other alternatives require further studies [30].
Kiran et al. [37]	Randomized Controlled Trial	N = 50 50 patients (aged 18-58 years) presenting with a clinical diagnosis of CCTH, were divided in 2 groups. Group 1 (n=30) received 8 lessons and practical demonstration of Brahmakumaris spiritual based meditation known as Rajyoga meditation for relaxation therapy, in addition to routine medical treatment (analgesics and muscle relaxants). Group 2 (n=20) patients received analgesics and muscle relaxants twice a day but no relaxation therapy in the form of meditation.	8 weeks	Subjects showed significant reduction in headache variables (P<0.001) in both groups. The Rajyoga meditation group showed significant decrease in severity of headache, duration and frequency 94%, 91% and 97% respectively compared to the control arm of 36%, 36% and 49% respectively. Pain relief calculated by headache index was 99% in Group 1 as compared to 51% in Group 2.

Kisan et al. (2014) [19]	Randomized Controlled Trial	N=60 Migraine patients were randomly given either standard of care (n=30) or yoga with standard of care (n=30) [19].	Yoga group received yoga practice session for 5 days a week for 6 weeks along with the standard of care [19].	Yoga with standard of care compared to the standard of care both showed significant improvement in frequency, intensity, and impact of the headache. However, there was greater improvement with yoga. Additionally, in the yoga with the standard of care group there was decreased sympathetic activity [19].
Libera et al. [27]		N = 94 CAM was used in 76 % patients of a cohort of 124 children affected by headache (age 4-16 years; 67 % female; 70 % migraine without aura, 12 % migraine with aura, 18 % tensive headache according to IHS criteria) consecutively recruited at a Pediatric Headache University Center [27].		CAM was used as preventive treatment in 80 % cases. The main reasons for seeking CAM were: the wish of avoiding chronic use of drugs with their related side effects, the desire of an integrated approach, the reported inefficacy of conventional medicine, and a more suitable children disposition to CAM than to pharmacological compound. Female gender, younger age, migraine without aura, parents' higher educational status, maternal use of CAM and other associated chronic conditions, correlated with CAM use (p<0.05). 73 % patients chose CAM also to treat other diseases (i.e. allergies, colitis, asthma, insomnia, muscle-skeletal disorders and dysmenorrhea) [27].
Wells et al. [21]	Randomized Controlled Trial	N = 19 9 episodic migraineurs randomized to either MBSR (n=10) or usual care (n=9) [21]	MBSR is a standardized 8-week mind/body intervention that teaches mindfulness meditation/ yoga. [21]	MBSR subjects had 1.4 fewer migraines/month (MBSR: 3.5 to 1.0 vs control: 1.2 to 0 migraines/month, 95% confidence interval CI [-4.6, 1.8], P = .38). However, it was not statistically significant. Headaches were less severe in intensity (-1.3 points/headache on 0-10 scale, [-2.3, 0.09], P = .053) and shorter in duration (-2.9 hours/headache, [-4.6, -0.02], P = .043) vs control. This pilot data was not statistically significant. Migraine Disability Assessment and Headache Impact Test-6 dropped in MBSR vs control (-12.6, [-22.0, -1.0], P = .017 and -4.8, [-11.0, -1.0], P = .043, respectively) [21].
Boroujeni et al. [12]		N = 32 Thirty-two female patients with migraine took part and were randomly divided into two groups. The control group (n=14) received medication and the yoga group (n=18) participated in 12 weeks yoga training in addition to receiving the same medication as that of the control group. [12]	3 months of yoga training	It was shown that in the yoga group there was a significant reduction of headache frequency, severity, and impact on patient's lives. The level of nitric oxide between the yoga and control group was unaffected [12].
Renjith et al. [38]	Randomized Controlled Trial	The study participants are randomized to intervention and control arms. The participants randomized to the intervention arm would receive the specific multicomponent intervention based on the protocol. The participants in the control arm would receive routine care. [32]	24 weeks	
Sharma et al. [20]		N = 60 30 subjects recruited to Ayurveda and Yoga (AY) group underwent traditional Panchakarma (Bio-purificatory process) using therapeutic Purgation followed by Yoga therapy, while 30 subjects of Control (CT) group continued on symptomatic treatment (NSAID's) for 90 days [20].	3 months	The AY group showed significant reduction in migraine symptoms including pain intensity (p<.001) and improvement in Headache related Quality of Life (p<.001) [20].
Vasudha et al. [23]	Open - labeled non-randomized	N = 60 30 subjects recruited to Ayurveda and Yoga (AY) group underwent traditional Panchakarma (Bio-purificatory process) using therapeutic Purgation followed by Yoga therapy, while 30 subjects of Control (CT) group continued on symptomatic treatment (NSAID's) for 90 days [23].	3 months Migraine disability assessment score, perceived stress, heart rate variability (HRV), and surface electromyography (EMG) of frontalis muscle were measured on day 1, day 30, and day 90 in both groups [23].	The AY group had significantly reduced migraine disability and perceived stress scores compared to the control group. Additionally, the AY group showed decreased activity of the frontalis muscle on EMG in comparison to the control group [23].



of their headaches. A meta-analysis by Anheyer et al. analyzed the effects of yoga on headaches where they found preliminary evidence supporting the effectiveness of yoga to improve features of headaches like duration, intensity and frequency in a short period of time. However, a systematic review by Skelly et al. showed less enthusiastic results but nonetheless positive, with only mild to moderate improvement for chronic pain conditions in different parts of the body after using alternative therapies like yoga and massage. In a study by Göksel et al., 110 primary headache patients completed a questionnaire regarding their use of complementary and alternative medicine to treat their headaches. This study has shown that massage was a beneficial alternative treatment in one-third of patients with primary headaches and those other alternative treatments like yoga had additional important role in relief treatment [30]. It was likewise shown that in people with primary headaches who tried alternative treatment, yoga has an important role in relief treatment. A meta-analysis by Bussing et al. has found that even short-term implementation of yoga was beneficial in treating patients with headache/migraine [31].

There is increasing scientific evidence showing that decreased physical activity is associated with increased prevalence of migraine and non-migraine headache, and aerobic exercise can be used as alternative therapy to improve headache [32,33]. Other studies reported that yoga, being a slow non-exertional aerobic exercise, is more beneficial than pure aerobic exercise since it enhances mood and alleviates stress and depression. Furthermore, in a systematic review by Amin et al. it was proposed that exercise for migraine prophylaxis may be related to increased beta-endorphins, endocannabinoids and other neurotrophic factors [34]. In conclusion, yoga may be the happy medium between the two for migraine headache prophylaxis.

## Discussion and Limitations

The review of the literature indicates that current studies often contain a small sample size. Larger sample sizes would be helpful in order to further study the potential of yoga as a treatment modality for headaches. Additionally, as of this writing, there is no standardized way of implementing yoga as a treatment modality for headache or pain in general. There are numerous kinds of yoga practice and the effects of each should be further studied to understand which yoga practices are most effective at reducing headache burden in individuals. Yoga is most commonly practiced by young, Caucasian, college-educated women who are already in good health [17-38]. This poses another limitation on the current studies and provides reason for further studies to be performed. A broader demographic sample size, along with evidence showing its efficacy across more races and ethnicities would provide stronger evidence as to its benefit.

## Conclusion

There is growing evidence that supports the benefits of yoga in improving physical and psychosocial health. Multiple studies and meta-analysis have been conducted to show the positive effect of yoga on various chronic pain syndromes and headache. Yoga was shown to improve quality of life, reduce headache intensity and headache frequency, when used alone or as an adjuvant to conventional therapy and show a significant decrease in headache frequency and intensity along with a reduction in the use of symptomatic medication. Yoga, being a slow non-exertional aerobic exercise, was reported to be more beneficial than pure aerobic exercise as it enhances mood and alleviates stress and depression. For children, who often require migraines-lifestyle management approach, yoga becomes an invaluable treatment alternative in the pediatric population as it can create a sustainable sleeping, exercising, and nutrition lifestyle. This review illustrates that by implementing yoga as a treatment modality for headaches, is a sustainable option that has little to no adverse effects, simple to implement and comes at a minimal cost to patients and society.

## Competing Interests

Abigail Brooks, Daniel Oved and Roni Sharon have no relevant conflicting

interests to declare. This study did not receive any funding from any group, corporation or institution.

## Author's Contributions

Abby Brooks - Data aggregation, analysis, and manuscript writing

Daniel Oved - Manuscript writing and editing

Roni Sharon - Review design, writing, and editing.

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