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CLINICAL PILATES IN HEADACHE DISORDERS: IMPLICATIONS FOR MIGRAINE MANAGEMENT

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ABSTRACT

Background: Migraine is one of the most prevalent and disabling neurological disorders worldwide, significantly affecting quality of life, daily functioning, and productivity. In addition to recurrent headaches, individuals with migraine commonly experience neck pain, sleep disturbances, anxiety, depression, and musculoskeletal dysfunction. Although pharmacological management remains the primary treatment approach, increasing attention has been directed toward non-pharmacological interventions such as physiotherapy and exercise-based rehabilitation.

Objective: To review the available literature regarding the role of Clinical Pilates in headache disorders and explore its potential implications in the management of migraine.

Methodology: A narrative review of literature was conducted using electronic databases including PubMed, Google Scholar, Scopus, and ScienceDirect. A total of 124 records were identified through database searching. After removal of duplicates and screening procedures, 8 studies meeting the inclusion criteria were included in the review. The selected studies evaluated the effects of Clinical Pilates, therapeutic exercise, and physiotherapy interventions on headache disorders, cervical dysfunction, pain, disability, sleep quality, and quality of life.

Results: The reviewed studies demonstrated that Clinical Pilates and exercise-based interventions were associated with improvements in pain intensity, headache-related disability, cervical posture, muscle endurance, sleep quality, and overall quality of life. Studies involving tension-type headache and cervicogenic headache reported significant reductions in pain and functional limitations following Clinical Pilates interventions. Evidence from migraine-related exercise studies further suggested that therapeutic exercise may contribute to reduced headache frequency and symptom burden.

Conclusion: Clinical Pilates appears to be a promising adjunctive intervention in the management of headache disorders. Its emphasis on postural correction, core stability, breathing control, flexibility, and

neuromuscular re-education may address several factors commonly associated with migraine. Although direct evidence in migraine populations remains limited, current findings support the potential role of Clinical Pilates as part of a multidisciplinary approach to migraine management. Further high-quality randomized controlled trials are required to establish definitive clinical recommendations.

Keywords: Clinical Pilates, Migraine, Headache Disorders, Physiotherapy, Exercise Therapy, Cervicogenic Headache, Tension-Type Headache, Rehabilitation.

INTRODUCTION

Migraine is a chronic, disabling neurological condition involving periodic moderate to severe headaches in addition to other symptoms of nausea, vomiting, photophobia, phonophobia, and disability. Migraine is a very prevalent neurological condition globally and a major contributor to Years Lived with Disability (YLDs), primarily in the younger and middle-aged group of populations. As a major global burden on individuals and healthcare systems, according to the World Health Organization, the condition of headache, primarily migraines, tops the list of disability-causing conditions internationally.[1]

Worldwide, migraine is seen to affect more than a billion population and is more prevalent with females and has a peak incidence seen at a younger and most productive age group of humans worldwide.[2] The Global Burden of Disease (GBD) epidemiological survey well indicates that migraine has emerged as a most disabling neurological condition in adolescents and second most disabling neurological condition in those below 60 years of age worldwide.[3,4] The impact of migraine is increasing steadily in developing nations like India because of modern lifestyle and lack of multidisciplinary management.

Migraine is becoming increasingly understood as a complex condition that goes beyond its episodic headaches. Moving away from its single symptom of headaches, patients with migraine may also suffer from insomnia, fatigue, anxiety, depression, neck pain, as well as compromised quality of life. Among these symptoms, neck pain is one of the major symptoms from which patients with migraine suffer, with over 70% of migraine patients experiencing neck pain during attacks or between attacks. [5]

Pharmaceutical treatment remains the mainstay in migraine management; however, many patients experience incompletely alleviated symptoms, intolerance to drugs, or concerns about long-term use of pharmacologic therapies.[6] As a result, non-pharmacologic modalities such as exercise therapy, relaxation therapies, yoga, and physiotherapies have increasingly been considered alternate modalities of therapies for migraine management.

Clinical pilates is an exercise technique guided by the physiotherapist and based on pilates principles adapted for therapeutic purposes. The main objectives of clinical pilates are correct posture, center of equilibrium control, breathing control, flexibility, and neuromuscular control. Although studies in migraine using clinical pilates are inconclusive in their results, the recent studies in other forms of headache such as tension-type headache and cervicogenic headache reveal the positive implications of clinical pilates in pain management, sleep quality improvement, general well-being, and functional outcomes.[7] The present study can be utilized as a literature review for understanding the implications of clinical pilates in migraine management.

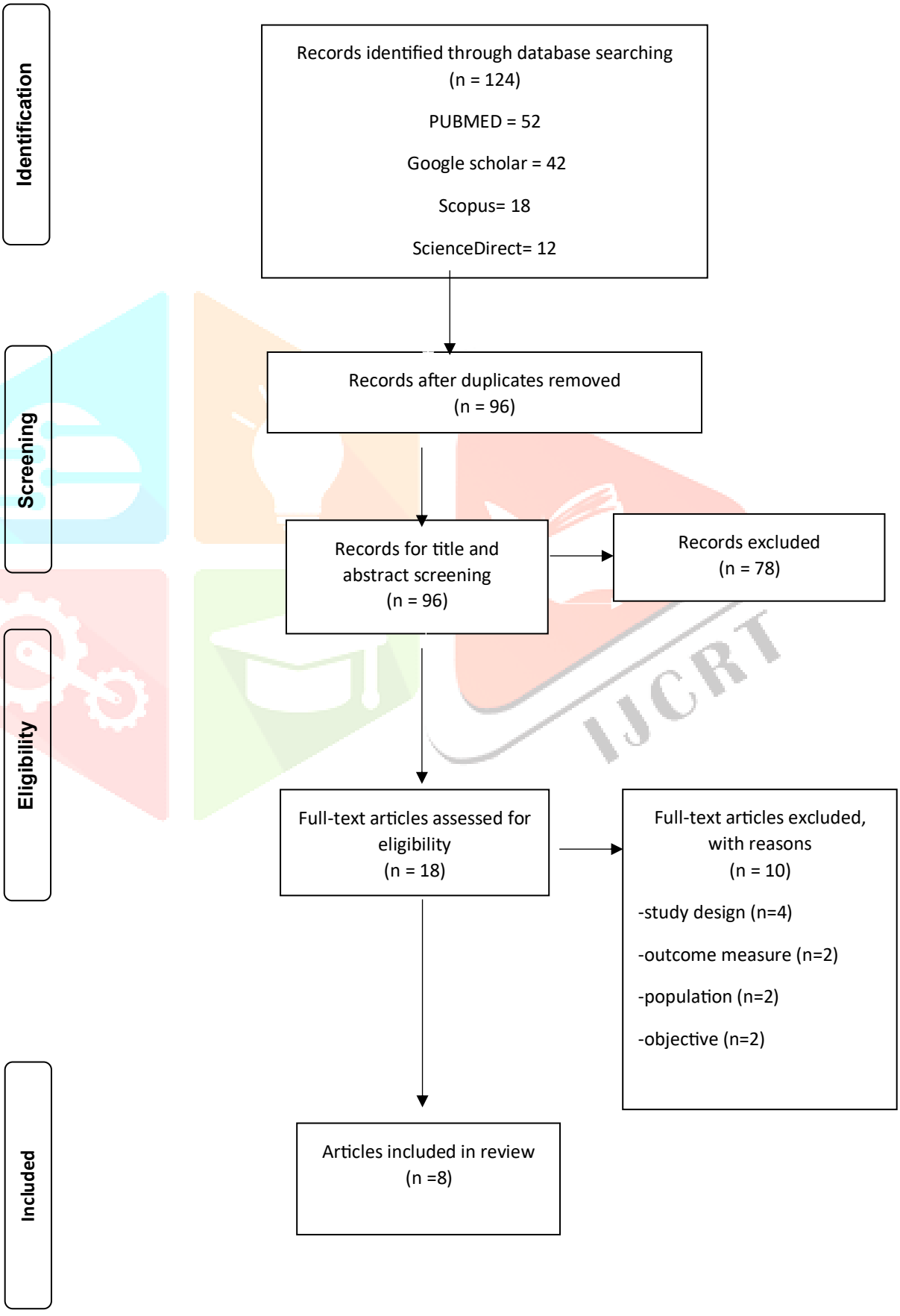
METHODOLOGY

A comprehensive narrative review was conducted to explore relevant literature on the chosen topic. Electronic databases including PubMed and Google Scholar were searched systematically, yielding a total of 124 records (PubMed = 52, Google Scholar = 42, Scopus= 18, ScienceDirect= 12). After removing duplicates, 96 unique records remained.

These records underwent title and abstract screening, resulting in the exclusion of 78 studies that did not meet the initial inclusion criteria. The remaining 18 full-text articles were assessed for eligibility. Among these, 10 articles were excluded due to various reasons including inappropriate study design (n=4),

irrelevant outcome measures (n=2), non-target population (n=2), and misalignment with the study objective (n=2).

Finally, 8 articles were included in the review based on their relevance and adherence to the inclusion criteria. The selection process followed the PRISMA guidelines to ensure transparency and reproducibility.



Author & Year	Objective	Study Design	Participants	Intervention	Outcome Measures	Key Results
Ashina et al. (2015)	To determine prevalence of neck pain in headache disorders	Population-based Study	Adults with migraine and tension-type headache	Not applicable	Neck pain prevalence	Neck pain was significantly associated with migraine and headache-related disability.
Komatsu et al., (2016)	To investigate the effectiveness of a structured Pilates exercise program on pain intensity, functional capacity, and quality of life among women diagnosed with fibromyalgia, a condition characterized by chronic widespread pain and symptoms often overlapping with migraine-related musculoskeletal dysfunction.	Randomized Controlled Trial	20 women diagnosed with fibromyalgia participated in the study. Participants were adults with chronic musculoskeletal pain and reduced physical function who were recruited from rehabilitation settings.	Participants underwent a supervised Pilates exercise program for 8 weeks. Sessions focused on core stabilization, flexibility, breathing control, postural alignment, and strengthening exercises. Outcomes were assessed before and after intervention.	Pain intensity, quality of life, functional capacity, flexibility, and physical performance.	The Pilates intervention resulted in significant reductions in pain intensity and improvements in quality of life and physical functioning. The findings support the role of Pilates-based rehabilitation in chronic pain conditions and provide indirect evidence for its application in migraine patients.
Lemmens et al., (2019)	To systematically evaluate the effectiveness of aerobic and therapeutic exercise interventions on migraine frequency, duration, pain intensity, and headache-related disability among individuals	Systematic review	The review included studies involving adult migraine patients who participated in various exercise-based interventions across multiple clinical settings.	Electronic databases were systematically searched and studies assessing exercise interventions in migraine populations were critically analyzed. Outcomes from randomized	Migraine frequency, headache intensity, headache duration, disability scores, and quality of life.	The review demonstrated that structured exercise programs were associated with reductions in migraine frequency and headache burden. Exercise was considered a safe and effective adjunctive treatment

	diagnosed with migraine.			and non-randomized studies were synthesized.		strategy for migraine management.
Luedtke et al. (2020)	To evaluate the effectiveness of physiotherapy interventions used in the management of headache and migraine and to determine the quality of evidence supporting non-pharmacological rehabilitation approaches.	Systematic Review	The review included studies involving patients diagnosed with migraine, tension-type headache, and cervicogenic headache across multiple healthcare settings.	Electronic databases were systematically searched and studies investigating physiotherapy interventions including exercise therapy, manual therapy, and multimodal rehabilitation were critically appraised and synthesized.	Pain intensity, headache frequency, disability, quality of life, cervical function, and patient-reported outcomes.	The review reported that physiotherapy interventions demonstrated positive effects on headache frequency, pain severity, disability, and functional outcomes. Exercise-based rehabilitation was identified as an important component of multidisciplinary headache management and may serve as an effective adjunct to conventional medical treatment.
Hürer et al., (2021)	To compare the effectiveness of Clinical Pilates exercises and conventional home exercise programs on cervical posture, muscle endurance, pain intensity, and functional disability in individuals with cervical dysfunction.	Randomized Controlled Trial	Forty-six individuals with sagittal cervical disorientation and associated neck dysfunction participated in the study.	Participants were randomly allocated to Clinical Pilates or home exercise groups. Interventions focused on postural correction, deep cervical muscle activation, and stabilization training.	Postural disorders, strength, endurance of deep cervical flexors (DCF), cervical range of motion (CROM), pain intensity and functional disability	Clinical Pilates produced significantly greater improvements in cervical alignment, muscle endurance, pain reduction, and functional status when compared with conventional home exercises, suggesting benefits for patients with migraine-related

						cervical impairments.
Varangot-Reille et al., (2022)	To determine the effectiveness of different therapeutic exercise modalities in reducing symptoms among patients with migraine and tension-type headache through a systematic review and meta-analysis.	Systematic Review & Meta-analysis	Studies involving patients diagnosed with migraine or tension-type headache were included. Various exercise modalities were examined.	Multiple databases were searched and pooled analyses were performed to evaluate the effects of therapeutic exercise on headache outcomes.	Headache frequency, pain intensity, disability, and quality of life.	Therapeutic exercise interventions significantly reduced headache frequency and pain intensity. Exercise was identified as an effective non-pharmacological strategy for improving headache-related outcomes and quality of life.
Leite et al., (2023)	To investigate the effects of Clinical Pilates exercises on pain severity, headache impact, sleep quality, neck disability, and psychological well-being in university students diagnosed with tension-type headache.	Case series	Nine university students with tension-type headache participated in the intervention program.	Participants completed a Clinical Pilates program emphasizing breathing exercises, core stabilization, flexibility training, and postural correction. Assessments were conducted before and after treatment.	HIT-6, Numerical Pain Rating Scale, Neck Disability Index, Pittsburgh Sleep Quality Index, anxiety and depression scores.	Participants demonstrated improvements in headache impact, pain intensity, sleep quality, neck disability, and psychological outcomes. The findings suggest Clinical Pilates may be beneficial for headache management and overall well-being.
Uzun et al., (2024)	To evaluate the combined effects of cervical mobilization and Clinical Pilates exercises on pain, muscle stiffness,	Randomized Controlled Trial	25 patients diagnosed with cervicogenic headache were recruited and randomly assigned to treatment groups.	The intervention combined cervical mobilization techniques with Clinical Pilates exercises	Pain intensity, cervical muscle stiffness, blood flow parameters, headache frequency,	Significant improvements were observed in pain intensity, cervical stiffness, and head and neck blood flow. The combined

	cervical blood flow, and functional outcomes in patients with cervicogenic headache			focusing on postural control, flexibility, and cervical stabilization. Outcomes were measured before and after treatment.	and functional status.	intervention demonstrated superior clinical benefits and supports the potential role of Clinical Pilates in headache rehabilitation programs.

DISCUSSION

Migraine is a highly prevalent neurological disorder and remains one of the leading causes of disability worldwide. Although pharmacological management remains the cornerstone of treatment, many patients continue to experience persistent symptoms, medication-related adverse effects, and reduced quality of life. Consequently, there has been increasing interest in non-pharmacological interventions that can complement conventional medical management. Among these interventions, Clinical Pilates has emerged as a promising therapeutic exercise approach due to its emphasis on postural correction, core stability, breathing control, flexibility, and neuromuscular re-education.

The findings of the present review indicate that Clinical Pilates and exercise-based rehabilitation may positively influence several factors associated with headache disorders and migraine. Although direct evidence investigating Clinical Pilates specifically in migraine populations remains limited, studies involving tension-type headache, cervicogenic headache, cervical dysfunction, and chronic pain conditions provide substantial support for its therapeutic application.

One of the most important findings emerging from the reviewed literature is the relationship between headache disorders and musculoskeletal dysfunction. Migraine is frequently associated with neck pain, cervical muscle tightness, postural abnormalities, and impaired cervical mobility. These impairments may contribute to central sensitization and increased headache severity. Hürer et al. (2021) demonstrated that Clinical Pilates significantly improved cervical posture, muscle endurance, pain intensity, and functional disability when compared with conventional home exercise programs.[10] These findings suggest that the postural correction and stabilization principles incorporated within Clinical Pilates may address underlying musculoskeletal impairments commonly observed in migraine patients.[10]

Similarly, Leite et al. (2023) reported improvements in pain intensity, headache impact, neck disability, sleep quality, anxiety, and depression following a Clinical Pilates intervention in individuals with tension-type headache.[7] These outcomes are particularly relevant because migraine is frequently accompanied by psychological symptoms and sleep disturbances. Improvements in these domains may contribute to a reduction in migraine burden and enhancement of overall quality of life.[7]

The study conducted by Uzun et al. (2024) further strengthens the evidence supporting Clinical Pilates in headache rehabilitation.[12] The authors observed significant reductions in pain intensity and cervical muscle stiffness when Clinical Pilates was combined with cervical mobilization. Improvements in cervical blood flow were also reported. These findings suggest that Clinical Pilates may exert its effects through both mechanical and physiological mechanisms, including improved cervical mobility, muscle relaxation, circulation, and neuromuscular control.[12]

The role of exercise in migraine management has been extensively investigated in recent years. The systematic review conducted by Lemmens et al. (2019) concluded that structured exercise interventions were associated with reductions in migraine frequency, headache intensity, and headache-related disability.[9] Similarly, Varangot-Reille et al. (2022) demonstrated that therapeutic exercise interventions significantly improved outcomes among patients with migraine and tension-type headache. These findings support the concept that exercise should be considered an essential component of multidisciplinary headache management.[11]

Several physiological mechanisms may explain the beneficial effects of Clinical Pilates in migraine management. First, Clinical Pilates promotes activation of deep stabilizing muscles of the trunk and cervical spine, thereby improving posture and reducing abnormal mechanical stress on cervical structures. Since cervical dysfunction has been linked with headache generation and perpetuation, improved spinal alignment may contribute to symptom reduction.

Second, the breathing techniques utilized in Clinical Pilates may positively influence autonomic nervous system regulation. Stress and autonomic dysfunction are recognized migraine triggers, and controlled breathing exercises may help reduce sympathetic nervous system overactivity while promoting relaxation. This may explain the improvements in anxiety levels and sleep quality observed in several studies. [7,12]

Third, regular participation in exercise programs has been shown to stimulate endogenous pain inhibitory mechanisms through increased release of endorphins, serotonin, and other neurochemical mediators involved in pain modulation. Exercise may also reduce systemic inflammation, improve cerebral circulation, and enhance overall physical fitness, all of which may contribute to reductions in headache frequency and severity.

Another important observation from the reviewed studies is the favorable safety profile of Clinical Pilates. Unlike high-intensity exercise programs that may trigger symptoms in some migraine sufferers, Clinical Pilates offers a low-impact, individualized approach that can be modified according to patient tolerance and functional capacity. This makes it particularly suitable for individuals with chronic pain, physical deconditioning, or associated musculoskeletal impairments. [7,10]

Despite the encouraging findings, several limitations should be acknowledged. The number of studies directly investigating Clinical Pilates in migraine populations remains limited. Most available evidence originates from studies involving tension-type headache, cervicogenic headache, or cervical dysfunction. Additionally, many studies included relatively small sample sizes and short intervention durations, which may limit generalizability. Variability in treatment protocols, outcome measures, and follow-up periods further complicates comparison across studies.

Future research should focus on conducting high-quality randomized controlled trials specifically evaluating the effectiveness of Clinical Pilates in migraine populations. Standardized intervention protocols and long-term follow-up assessments are required to determine the optimal frequency, intensity, and duration of Clinical Pilates programs. Furthermore, future studies should investigate the effects of Clinical Pilates on migraine frequency, pain intensity, disability, sleep quality, psychological well-being, and quality of life using validated outcome measures.

Overall, the available evidence suggests that Clinical Pilates may serve as a valuable adjunctive intervention within a multidisciplinary approach to migraine management. Its ability to address postural dysfunction, musculoskeletal impairments, sleep disturbances, and psychological factors makes it a comprehensive therapeutic strategy that warrants further investigation.

CONCLUSION

Clinical Pilates is an emerging physiotherapeutic intervention that demonstrates considerable potential in the management of headache disorders. The findings of this review indicate that Clinical Pilates may improve pain intensity, postural alignment, cervical muscle function, sleep quality, functional ability, and overall quality of life. Evidence from studies involving tension-type headache, cervicogenic headache, cervical dysfunction, and exercise-based migraine rehabilitation consistently supports the beneficial role of therapeutic exercise in reducing headache burden.

Although direct evidence specifically investigating Clinical Pilates in migraine populations remains limited, the available literature suggests that its emphasis on postural correction, neuromuscular control, breathing regulation, and flexibility may address several factors commonly associated with migraine. Furthermore, Clinical Pilates appears to be a safe, low-impact, and individualized intervention that can be incorporated into multidisciplinary migraine management programs.

The current evidence supports the inclusion of Clinical Pilates as an adjunct to conventional medical treatment; however, additional high-quality randomized controlled trials are required to establish definitive clinical guidelines. Future research should focus on determining the long-term effectiveness of Clinical Pilates and identifying optimal treatment protocols for individuals with migraine. Based on the available evidence, Clinical Pilates may represent a promising and clinically relevant non-pharmacological strategy for improving outcomes in patients with headache disorders and migraine.

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