

EFFECTS OF YOGIC PRACTICES ON PAIN AND QUALITY OF SLEEP IN OSTEOARTHRITIS OF THE KNEE JOINT AMONG MIDDLE-AGED WOMEN

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ABSTRACT:

Knee osteoarthritis (KOA) is a prevalent degenerative joint disorder that significantly impairs mobility, psychological well-being, and overall quality of life, particularly among middle-aged women. This experiment compared the impact of an organized 12-week yogic intervention on pain and sleep quality in women aged 35-55 years with KOA. A random assignment of 90 individuals (45 experimental and 45 control) was made to undergo either yogic training or an active-rest routine, respectively. The validated measures which were used as pre- and post-tests were the Visual Analogue Scale (VAS) to investigate pain and the Pittsburgh Sleep Quality Index (PSQI). Findings showed the strong decrease of pain and the significant enhancement of sleep quality of those engaging in yoga, with the controls showing a minor change in both of these variables only. These results demonstrate yoga as a non-pharmacological, holistic, and effective therapy to help in pain and sleeping disruptions in knee osteoarthritis. Incorporating yoga into routine management may improve patient outcomes and promote long-term well-being among women with knee osteoarthritis.

KEYWORDS: Yoga, Knee Osteoarthritis, Pain, Quality of Sleep, Middle-Aged Women

INTRODUCTION

Knee osteoarthritis (KOA) is one of the most prevalent degenerative joint disorders affecting middle-aged and older adults worldwide. Characterized by progressive cartilage deterioration, chronic pain, and functional limitations, KOA substantially reduces mobility and impairs quality of life. According to Girish and Subhadra, KOA develops gradually and is influenced by aging, biomechanical stress, and prolonged inflammatory processes, which collectively weaken joint structures and accelerate degeneration (Girish and Subhadra, 2025). As the condition advances, people tend to find it challenging to carry out normal tasks like using stairs, walking long distance or standing in one position mostly caused by constant pain. Recent therapeutic guidelines emphasize the need for non-pharmacological interventions alongside conventional medical therapies for KOA. The American College of Rheumatology highlights exercise, weight management, and lifestyle modification as essential components of KOA management (Kolasinski et al., 2020). Despite these recommendations, many individuals affected by KOA rely heavily on pain medications, which provide only temporary relief and may pose long-term risks. This has increased interest in alternative and holistic approaches that are safe, accessible, and sustainable.

Yoga has emerged as a promising complementary therapy for managing musculoskeletal disorders, including KOA. As noted by Gandolfi and colleagues, yoga offers an integrative mind-body approach that blends physical postures, breathing techniques, and meditative practices, supporting both physical and emotional well-being (Gandolfi et al., 2025). The accumulating evidence would say that yoga has potential to alleviate chronic pain and help a person relax, and this would impact the quality of sleep in a positive way. Early research demonstrated that yoga significantly reduces pain among individuals with KOA (Ebnezar et al., 2012). Subsequent studies have reinforced these findings. For instance, Deepeshwar and co-researchers showed that yoga-based lifestyle practices effectively improved knee function and reduced disability levels in osteoarthritis patients (Deepeshwar et al., 2018). Similarly, Lauche and colleagues found that yoga yields improvements comparable to physiotherapy in pain and functional outcomes (Lauche et al., 2019). These findings highlight yoga's potential not only as an adjunct therapy but also as an independent intervention for KOA management.

Recent randomized controlled trials provide robust support for yoga interventions in KOA populations. The mounting evidence would tell us that yoga can reduce chronic pain and makes an individual relax and this would have a positive effect on the quality of sleep (Bennell et al., 2022). In another clinical trial, Abafita and colleagues found yoga to be more effective than strengthening exercises in improving pain and function, suggesting yoga may offer unique

biomechanical and psychological benefits (Abafita et al., 2025). Systematic reviews further validate these findings. A meta-analysis by Astayogi and collaborators concluded that both Hatha and Iyengar yoga significantly enhance mobility and overall quality of life among KOA patients (Astayogi et al., 2024). Another review by Biswas and colleagues identified key components that make yoga-based interventions particularly effective, such as consistent practice frequency, structured progression, and incorporation of breathing techniques (Biswas et al., 2024). In the same vein, Lu and colleagues discovered that yoga results in statistically significant changes in pain-related outcomes in various randomized controlled trials (Lu et al., 2024). The other studies emphasize the positive role of yoga in alleviating pain in varied groups of people. Indicatively, Mirzaei and colleagues reported on major declines in musculoskeletal pain in elderly women undergoing a formal yoga practice (Mirzaei et al., 2022). Also, Cardozo and other researchers noted that their well-organized movement-based interventions help to manage pain effectively, which further underlines the importance of yoga as a therapeutic intervention that can also assist with better quality of sleep (Cardozo et al., 2021). In addition to physical discomfort, KOA in many cases is accompanied by sleep disorders, which only exacerbate the perception of pain and the level of current functioning. Kumar and Singh reported that yogasana practices not only reduced knee pain but also enhanced overall well-being among middle-aged women (Kumar & Singh, 2025). Sleep compromised quality has been revealed to increase pain sensitivity and slow down the process of recovery, which triggers the development of a vicious cycle of worsening symptoms. Hence, interventions that can treat both pain and sleep quality are of importance, especially. Yoga is uniquely positioned to target these interconnected challenges. As demonstrated in recent reviews, mindfulness-based breathing and meditative components of yoga have a calming effect on the nervous system, leading to measurable improvements in sleep quality (Astayogi et al., 2024). Furthermore, integrated yoga practices have been shown to positively influence emotional regulation and coping mechanisms, contributing to overall well-being.

Despite the many studies that affirm the positive effects of yoga on KOA, more studies are needed to specifically investigate its synergistic effect on pain and quality of sleep among middle-aged women who are a group of population most susceptible to chronic pain as well as disruption of sleep. Many women in this age group experience compounded burdens due to household responsibilities, occupational demands, and physiological transitions, making non-pharmacological interventions particularly valuable. Given the limitations of conventional treatment and the growing evidence supporting yoga as a holistic therapeutic strategy, the current research aims to assess how organized yogic sessions affect pain and sleep quality in elderly females with knee osteoarthritis (35–55 years old). These two outcomes are emphasized, by which it will be possible to concentrate on the key results this study aims to contribute meaningful insights into the role of yoga as a comprehensive, accessible, and sustainable non-pharmacological therapy.

2. METHODOLOGY

2.1 Research Design and Study Framework

The current research was a randomized controlled trial to investigate the impact of a structured yogic intervention on painful feelings and sleeping quality in middle-aged women with osteoarthritis of the knee joint. A two-group pre-test and post-test format was utilized, consisting of an experimental group receiving the yoga intervention and a control group that maintained an active-rest routine without any form of yogic or exercise-based practice. The chosen study design was aimed at creating definite causal conclusions on the effect of yogic practices on the variables of interest which in this case are pain and quality of sleep.

2.2 Selection of Participants

The study included a total sample of ninety middle-aged women between 35 - 55 years of age who had been clinically diagnosed with knee osteoarthritis by a qualified orthopedic specialist. Selection occurred within the local community of Andhra Pradesh using voluntary participation procedures. All participants were screened according to defined inclusion and exclusion criteria to ensure suitability for the intervention. Women who had no prior experience with yoga or structured exercise programs and who were not on analgesic medication were included, while those unwilling to consent or using painkillers were excluded. After screening, participants were randomly assigned to either the experimental group (n = 45) or the control group (n = 45) through a computer-generated randomization process.

2.3 Ethical Considerations

Before data collection, all participants were informed about the purpose, procedures, potential risks, and benefits of the study. Written informed consent was obtained from each participant. Confidentiality of participant information was maintained throughout the study. The research protocol adhered to ethical standards for human subjects and aligned with guidelines established by the institutional ethics committee.

2.4 Yogic Intervention Protocol and Control Conditions

The intervention consisted of a structured yogic training program administered to the experimental group over a period of twelve consecutive weeks. Participants engaged in sixty-minute sessions conducted five days per week in the early morning hours. The program incorporated Sukshma Vyayama, AUM chanting, Surya Namaskara sequences, selected asanas targeting lower-limb flexibility and strengthening, pranayama practices such as Nadi Suddhi and Kapalabhati, and guided meditation for mental relaxation. The choice of these practices was based on the principles of minimizing pain and encouraging relaxation that allows to achieve better sleep. All sessions were conducted by a certified yoga therapist who ensured that postures and breathing techniques were performed safely and were adapted to each participant's physical capacity. The control group continued their routine daily activities but did not participate in any structured physical or yogic exercise.

2.5 Instruments and Outcome Measures

To evaluate the impact of the intervention, both physiological and psychological variables were assessed at baseline and after the twelve-week training period. Pain intensity was measured using the Visual Analogue Scale (VAS), a widely validated instrument for assessing subjective pain levels. Quality of sleep was measured according to the Pittsburgh Sleep Quality Index (PSQI), which determines the duration of sleep, the bad sleep, and the efficiency of sleep. There were no other physiological or psychological variables that were considered in the study. These tools were selected due to their reliability, ease of administration, and global acceptance in research involving musculoskeletal and psychological health.

2.6 Procedures for Data Collection

Pre-test data were collected from both groups one week before the commencement of the intervention. All measurements were administered under standardized conditions to ensure accuracy and consistency. The experimental group then participated in the yogic training for twelve weeks, while the control group engaged only in normal daily routines without any intervention. Following the completion of the training period, post-test assessments were conducted using the same instruments and procedures as the baseline evaluation. To maintain objectivity, the assessor responsible for data collection was blinded to group allocation.

2.7 Statistical Methods and Analytical Techniques

The collected data were tabulated and analyzed using appropriate statistical techniques. The pre-test to post-test within-group comparisons were conducted by using the paired t-tests to identify the significant changes in pain and quality of sleep over time. Between-group comparisons of post-test scores were analyzed using independent t-tests to evaluate the effectiveness of the yoga intervention compared to the control condition. All statistical tests were conducted at a 0.05 level of significance. Data analysis was performed using standard statistical software, ensuring accurate interpretation of findings.

3. RESULTS

3.1 Overview of findings

This chapter reports the results of the study that investigated the impact of a 12-week yogic program on pain and quality of sleep in the middle-aged women diagnosed with knee osteoarthritis. Statistical analyses were conducted using paired t-tests to determine within-group differences from pre-test to post-test and independent t-tests to compare differences between the experimental and control groups. The findings reveal that the experimental group of participants that took part in the yogic training exhibited a considerable advancement in the reduction of pains and quality of sleep, which was not significant or changeable in the control group.

3.2 Baseline Characteristics

At baseline, the control and experimental groups had equal scores regarding the quality of sleep and pain. The similarity in pre-test values indicates that the groups were homogeneous before the intervention, ensuring that subsequent differences could be attributed to the yogic practices rather than pre-existing variation.

Table 1. Baseline Characteristics of Participants

Variable	Experimental (n = 45) Mean $\pm$ SD	Control (n = 45) Mean $\pm$ SD	p-value
Pain (VAS)	7.2 $\pm$ 1.1	7.0 $\pm$ 1.3	0.48
Sleep Quality (PSQI)	13.2 $\pm$ 3.1	13.6 $\pm$ 3.4	0.59

Table 1 demonstrates that there was no statistically significant difference between the groups at baseline; the groups were comparable before the intervention.

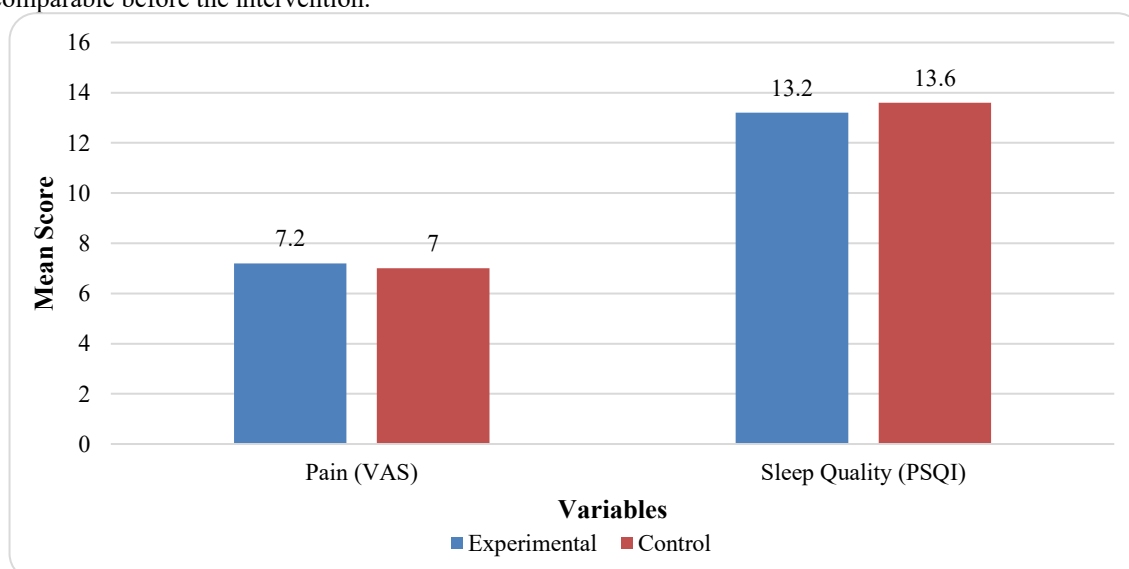


Figure 1. Baseline Comparison of Variables Between Groups

Figure 1 demonstrates the comparison of the baseline levels of pain (VAS) and quality of sleep (PSQI) in the experimental and the control groups. This figure shows that both groups were similar in their mean scores of pain and sleep quality prior to the intervention and thus the homogeneity of the groups is proved.

3.3 Pain Scores (VAS)

A significant reduction in pain scores was observed in the experimental group following the 12-week yoga program. Pain levels decreased from a pre-test mean of 7.2 to a post-test mean of 3.1, demonstrating substantial improvement in knee comfort and daily functioning. In contrast, the control group showed only a slight and statistically insignificant reduction from 7.0 to 6.6. To present the magnitude of change more clearly, the pre-test and post-test pain scores for both groups are displayed in Table 2. These results highlight the strong therapeutic effect of yoga on pain reduction.

Table 2. Pain Scores (Pre-Test and Post-Test)

Group	Pre-Test Mean $\pm$ SD	Post-Test Mean $\pm$ SD	t-value	p-value
Experimental	7.2 $\pm$ 1.1	3.1 $\pm$ 1.3	21.54	<0.001*
Control	7.0 $\pm$ 1.3	6.6 $\pm$ 1.4	1.42	0.16

As evidenced in Table 2, only the experimental group exhibited a statistically significant reduction in pain, whereas the control group showed little change over the intervention period.

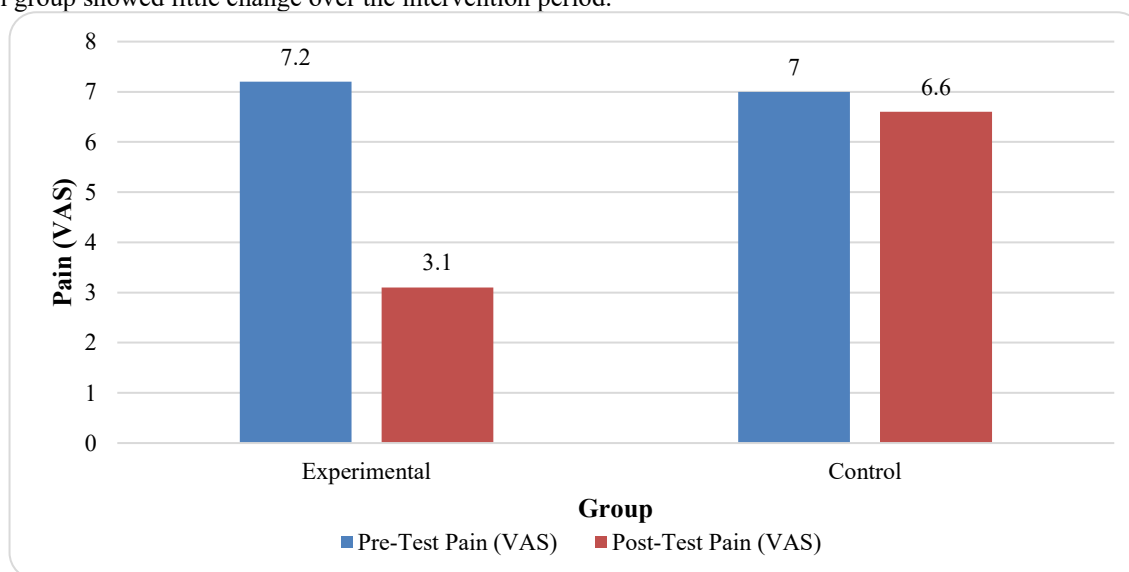


Figure 2. Pain Scores Before and After Yoga Training

Figure 2 visually depicts this reduction in pain scores, clearly showing the steep decline in the experimental group compared to the almost flat trend observed in the control group.

3.4 Quality of Sleep (PSQI)

The yoga intervention produced a substantial improvement in sleep quality among the experimental group. The average PSQI score decreased from 13.2 to 7.1, reflecting deeper, more restorative sleep and fewer nighttime disturbances. The control group showed no significant improvement. Table 3 presents the pre-test and post-test sleep quality scores, indicating clear differences between groups.

Table 3. Sleep Quality Scores (Pre-Test and Post-Test)

Group	Pre-Test Mean $\pm$ SD	Post-Test Mean $\pm$ SD	t-value	p-value
Experimental	13.2 $\pm$ 3.1	7.1 $\pm$ 2.9	12.76	<0.001*
Control	13.6 $\pm$ 3.4	13.1 $\pm$ 3.3	1.12	0.27

As shown in Table 3, the experimental group achieved a significant improvement in sleep quality, further confirming the holistic benefits of yoga for women with knee osteoarthritis.

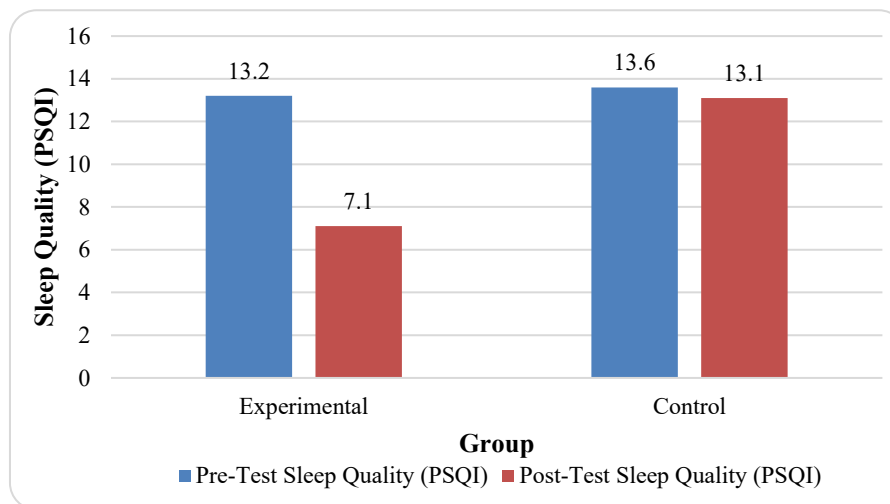


Figure 3. Sleep Quality Before and After Yoga

Figure 3 presents a visual comparison of sleep quality scores, clearly demonstrating the sharp improvement in the experimental group versus the minimal change in the control group. In general, the findings indicate that the 12-week yogic program has resulted in the statistically significant effects on pain reduction and the quality of sleep in middle-aged women with knee osteoarthritis. There was no significant change in both the variables in the control group. These results have a high level of empirical evidence on the efficacy of yoga as a non-pharmacological treatment of pain and sleeps disturbances in this group.

4. DISCUSSION

The results of the current study indicate that an organized 12-week yogic intervention had a considerable positive effect on pain and quality of sleep in middle-aged women with knee osteoarthritis (KOA). These outcomes support the growing evidence that mind-body exercises offer multidimensional therapeutic benefits for individuals experiencing degenerative joint disorders. The reduction in pain severity observed in the experimental group aligns with previous research showing that exercise-based programs, especially those involving controlled movement and muscle engagement, have beneficial effects on KOA symptoms (Mo et al., 2023). The enhanced quality of sleep is another aspect that characterizes holistic nature of yoga which incorporates physical poses, breathing exercises as well as meditation to help relieve discomfort of the body as well as restore well being.

The substantial decrease in pain scores following yoga practice reflects the therapeutic potential of low-impact, controlled movement interventions. Similar findings were reported in a quasi-experimental study on chair yoga, where older women with KOA demonstrated enhanced functional fitness and reduced pain during daily activities (Yao et al., 2023). The decrease of pain which has been seen in the current study can be explained by increased muscular relaxation, increased circulation in the joints and less neuromuscular tension which is caused by regular practice of yogic techniques. A systematic review evaluating mind-body exercises for KOA also concluded that such interventions consistently improve knee function and mobility (Qiao et al., 2024). Together, these results indicate that yoga serves as an effective alternative to conventional strengthening exercises for enhancing joint performance.

Yoga's effectiveness in the present study corresponds with previous investigations comparing yoga to other exercise modalities. A randomized trial protocol by Singh and colleagues emphasized that yoga could be as effective as strengthening programs in reducing symptoms of KOA, and might even provide superior benefits due to its meditative components (Singh et al., 2022). Also, a study on Baduanjin qigong, another mind-body intervention, showed a reduction in pain symptoms in KOA patients, which again associated mindful movement with pain management (Ye et al., 2020). These results place yoga in a larger framework of effective mind-body therapies that can be used in the treatment of the chronic musculoskeletal pains.

In addition to reduction of pain, yoga group members had significant increases in quality of sleep. Sleep deprivation is the issue that is shared by most people with chronic pain disorders because pain disrupts the process of sleep, the amount of sleep, and the quality of sleep. The quality of sleep improvement that was registered in the current study can be attributed to the effect of calming of the autonomic nervous system activity and relaxation of the body through the practice of yogic breathing and meditation. These results are in line with a meta-analysis that showed yoga interventions as an effective intervention to promote better sleep and lower levels of insomnia in women (Wang et al., 2020). A better sleep could also have an indirect effect on perception of pain, in that sufficient rest increases the perception of pain and recovery. The positive impact on the quality of sleep observed in the current research also support the results of systematic reviews of mind-body interventions. It was found by Weber and others that sleep quality and overall well-being of older adults are improved with the use of meditative movement therapies (Weber et al., 2020). Yoga can potentially break the cycle of pain affecting sleep and vice versa, as both pain and sleep problems can be solved by means of yoga. The twofold influence is especially significant to middle-aged females who tend to be faced with compounded issues of persistent pain, physiological changes, and lifestyle needs.

The multidimensional changes in this research highlight the appropriateness of yoga as an all-purpose therapeutic procedure in knee osteoarthritis. Interventions which address the quality of sleep as well as the pain and which are lifestyle-based have been progressively prescribed in the management of the chronic joint conditions. Based on a

narrative review, Nguyen et al. emphasize that exercise and mindfulness-based interventions can be capable of aiding pain outcomes and sleep-related health outcomes in arthritis patients to a significant degree (Nguyen et al., 2025). The current results support this view and show that yoga presents an integrative approach complementing the medical management of pain, which also takes care of pain relief and restful sleep.

Although the current research is a solid argument in support of the advantages of yoga in pain management and quality sleep enhancement, some weaknesses must be mentioned. To give an example, a study comparing yoga with physical therapy with regard to the chronic low back pain showed that yoga was no worse than regular physical therapy, and added mental health benefits (Saper et al., 2017). The same was concluded by a network meta-analysis that proved that different mindbody techniques are highly efficient in decreasing chronic musculoskeletal pain and ensuring the overall health of older adults (Zhu et al., 2024). All these similarities imply that the mechanisms of action of yoga in regard to pain modulation and relaxation could be used in various musculoskeletal pain disorders, which adds more weight to its applicability in treating pain and sleep disturbances in knee osteoarthritis.

The changes in the pain and the quality of sleep indicate the importance of yoga as a safe, readily available, and holistic treatment method among women with knee osteoarthritis. Since osteoarthritis is a chronic disease with a low long-term effectiveness of pharmacological treatment, yoga addition to the regular treatment regimen is likely to lead to improvement in patient outcomes by treating both pain management and sleep deficit. Moreover, as the use of mind-body interventions continues to be popularized all around the world, such comparative studies as yoga versus other forms of interventions like tai chi, qigong, and Pilates will become indispensable. Such comparative methods are justified by a systematic review of mind-body exercises related to knee osteoarthritis that found variability in the effect sizes among the various practices (Qiao et al., 2024). The long run effects of yoga on pain and quality of sleep are not well understood due to the lack of bigger samples, intervention period and post treatment assessment in future research.

CONCLUSION

The current research indicates that a 12-week well-organized yogic program can be used to greatly enhance the degree of pain and sleep quality in middle-aged females with knee osteoarthritis. Making yoga participants experience significant decreases in the level of pain, it is possible to conclude that yoga is an effective method of low-impact and non-pharmacological interventions to reduce the experience of osteoarthritis-related pain. The results indicate the possibilities of the yogic practices to reduce chronic pain without causing any extra stress to the already damaged joints. In addition to pain relief, the research also showed significant changes in quality of sleep improvement in the experimental group of participants. Better sleep can also be a very important aspect to overall symptoms as restorative sleep has been found to help in increasing pain tolerance, recovering more readily and daily functioning. Combined with relaxation practices and breathing techniques in yoga, the latter were probably the contributors to such positive sleep results. Conversely, the control group showed little variation in pain and quality of sleep, which is another supporting point to the therapeutic importance of yoga. On the whole, the results can justify the use of yoga as a non-pharmacological complementary intervention in the usual osteoarthritis management techniques. The continuous use of yogic exercises can help alleviate pain and increase sleep quality, which corresponds to better well-being and quality of life of middle-aged women with knee osteoarthritis.

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