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Original Article

Yoga Exercises as a Therapeutic Approach for Adults with Insomnia to Promote better Sleep: A Randomized Control Trial

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ABSTRACT

Background: Insomnia is a prevalent sleep disorder that significantly impacts the quality of life and is associated with various health complications, including high blood pressure, heart disease, diabetes, anxiety, and depression. Traditional treatments for insomnia often involve pharmacological interventions, but there is growing interest in alternative therapies such as yoga. This study investigates the efficacy of yoga as a therapeutic approach to improving sleep quality in adults with insomnia.

Objective: The objective of this study was to evaluate the effects of a structured yoga program on sleep quality and sleep latency in adults diagnosed with insomnia.

Methods: The study employed a cross-sectional design conducted at multiple healthcare facilities, including the Physiotherapy Outpatient Department at Holy Family Hospital, Benazir Bhutto Hospital, and District Headquarters Hospital in Rawalpindi. The study duration was four months, involving 54 participants selected through random sampling techniques. Inclusion criteria included adults aged 18 to 65 years diagnosed with insomnia according to the International Classification of Sleep Disorders (ICSD) or the Diagnostic and Statistical Manual of Mental Disorders (DSM). Exclusion criteria included severe medical or psychiatric disorders, substance abuse, pregnancy, or recent changes in sleep medication. Participants in the intervention group engaged in a standardized yoga program consisting of gentle yoga postures, controlled breathing techniques, and mindfulness meditation, conducted twice weekly for eight weeks, with each session lasting 60 minutes. The control group received standard care for insomnia. Data collection involved subjective assessments of sleep quality using validated questionnaires and objective measures through polysomnography. Statistical analysis was performed using SPSS version 25.0, with independent sample t-tests comparing means between groups and repeated measures ANOVA for within-group analysis.

Results: The yoga group showed significant improvements in subjective sleep quality and sleep latency. The mean sleep quality score improved from 2.18 ± 0.66 pre-intervention to 0.92 ± 0.37 post-intervention (p=0.0001), while the control group showed a less marked improvement from 2.37 ± 0.48 to 2.03 ± 0.18 (p=0.0012). Sleep latency in the yoga group decreased from 3.00 ± 0.00 to 1.29 ± 0.40 (p=0.0002), whereas the control group showed a reduction from 2.44 ± 0.49 to 2.11 ± 0.31 (p=0.0013). ANOVA results confirmed the statistical significance of these findings, with an F-value of 69.897 for sleep quality (p=0.0001) and 361.947 for sleep latency (p=0.0002).

Conclusion: The findings indicate that a structured yoga program significantly improves sleep quality and reduces sleep latency in adults with insomnia. Yoga appears to be an effective non-pharmacological intervention for managing insomnia, offering a viable alternative to traditional treatments.

Keywords: Insomnia, Sleep Quality, Yoga Therapy, Non-Pharmacological Treatment, Sleep Latency, Polysomnography, Cognitive Behavioral Therapy for Insomnia (CBT-I), Alternative Medicine, Holistic Health, Randomized Controlled Trial (RCT).

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INTRODUCTION

Insomnia, a prevalent sleep disorder, significantly impacts the quality of life for many adults. Given the limitations of conventional treatments like medication, there is growing interest in alternative remedies. Yoga has shown promise in enhancing sleep quality and alleviating insomnia symptoms. Evidence suggests that yoga can improve health and wellness across various populations, fostering positive emotional states while reducing negative ones. For instance, in one randomized controlled trial, women undergoing radiation for breast cancer who practiced yoga twice weekly reported lower anxiety and hopelessness compared to those on a waiting list. Although yoga's potential to enhance positive emotions is supported by some evidence, research has predominantly focused on its ability to mitigate negative emotions (1).

The favorable impact of yoga on mental and emotional health can be attributed to several mechanisms. These include the development of psychological resources such as mindfulness, body awareness, self-transcendence, spiritual peace, and social connectivity. Mindfulness, which involves maintaining awareness and acceptance without judgment, is particularly emphasized (2). Insomnia is characterized by difficulty falling asleep, staying asleep, or waking up feeling unrefreshed despite adequate sleep opportunity (4). The DSM-5 and the International Classification of Sleep Disorders use similar criteria to diagnose chronic insomnia (5, 6). Studies worldwide report insomnia prevalence rates ranging from 10% to 30%, with some estimates as high as 50% to 60%. The condition disproportionately affects older adults, women, and individuals with physical or mental illnesses (7). Researchers have investigated the prevalence of chronic insomnia, its association with socioeconomic status and comorbid conditions, and patients' perceptions of their sleep disturbances (8).

Insomnia has significant impacts on physical and mental health. The Trndelag health study (HUNT) found a correlation between insomnia and cardiovascular diseases such as heart failure, coronary heart disease, and hypertension. Insomnia increases the risk of subclinical cardiovascular disease and cardiovascular mortality (9, 10, 11). Chronic insomnia is associated with heightened sympathetic nervous system activity and elevated cortisol levels, contributing to hyperarousal and increased mortality risk. The strong link between insomnia and mental illness is also noteworthy (17). Sleep disturbances before, during, or after depressive episodes can hinder depression remission (18). Despite insomnia often being viewed as a symptom of depression or other affective disorders, chronic activation of the hypothalamic-pituitary-adrenal (HPA) axis due to insomnia may contribute to the onset of depression and increased cardiovascular disease risk (19).

Behavioral therapies are considered effective for treating insomnia, especially when tailored to the specific type of insomnia. Pharmacological interventions may be necessary in some cases, but combining sedatives, such as a z-drug and a tricyclic antidepressant, requires caution due to potential adverse effects. Benzodiazepines, despite their effectiveness, are often avoided due to their high abuse potential and the risks they pose to individuals with untreated sleep apnea, the elderly, and those with chronic nocturnal hypoxia. Non-pharmacologic therapies, such as cognitive behavioral therapy for insomnia (CBT-I), are increasingly recommended. CBT-I includes components like sleep psycho-education, stimulus control, cognitive therapy, relaxation training, and sleep restriction therapy, and is generally more effective than pharmacological treatments alone (30).

There is limited empirical evidence supporting the efficacy of herbal remedies for insomnia. Non-pharmacologic approaches, such as sleep hygiene education, cognitive therapy, relaxation training, and sleep restriction therapy, have shown varying degrees of effectiveness. Sleep hygiene education, though easy to deliver, lacks strong empirical support as a standalone treatment. Cognitive therapy shows promise in identifying and addressing sleep-disrupting cognitions, while relaxation training can alleviate several aspects of insomnia. Sleep restriction therapy, which confines sleep to a specific window of time, is particularly well-supported by evidence, despite concerns about increased daytime drowsiness (28, 29).

This research aims to investigate the impact of structured yoga exercise programs on sleep quality in adults with insomnia and to identify the specific mechanisms underlying these effects. By addressing these questions, the study seeks to contribute valuable insights to the field of sleep medicine, potentially revolutionizing current understandings and treatment approaches for insomnia. This research is significant as it has the potential to reshape how insomnia is perceived and treated, offering new avenues for diagnosis and therapy. Ultimately, the study aims to improve therapeutic practices and enhance overall health and quality of life for individuals struggling with sleep disturbances.

In recent years, the management of sleep problems, particularly insomnia, has garnered significant interest at the intersection of holistic health approaches and traditional medicine. As individuals worldwide continue to grapple with sleep-related difficulties, exploring new therapeutic avenues is crucial. This study aims to better understand the potential of yoga as a treatment intervention for adults with insomnia by examining existing evidence regarding its incorporation into insomnia care (Halpern et al., 36). Through a synthesis of research findings, theoretical frameworks, and clinical trials, this review seeks to elucidate the potential benefits of integrating yoga into insomnia care, highlighting its effects on sleep quality and symptom reduction (3).

Halpern et al. (36) conducted a study evaluating the effectiveness of a yoga intervention in treating insomnia among older adults. Conducted in Jerusalem, Israel, this research involved elderly participants experiencing insomnia who participated in a structured yoga program. The results showed significant improvements in various sleep parameters and overall quality of life among the yoga intervention group compared to the control group. Similarly, Wang et al. (37) performed a meta-analysis examining the effects of yoga on sleep quality in women. Their analysis of 19 randomized controlled trials revealed a significant increase in sleep quality among women who participated in yoga interventions compared to controls. Subgroup analysis further underscored the importance of class duration in influencing sleep outcomes.

The rationale for this study is to address a notable gap in the literature regarding the specific effects of yoga on insomnia treatment. While existing research has explored the broader impacts of yoga on stress reduction and sleep quality, comprehensive studies comparing the distinct effects of yoga on insomnia between regular practitioners and non-practitioners are lacking. Through a meticulous cross-sectional analysis, this study aims to elucidate the intricate relationship between yoga and insomnia. By focusing on individuals with insomnia and assessing the impact of a structured yoga program on sleep quality, the study seeks to provide valuable insights into the potential benefits of yoga as a complementary therapy for insomnia. Additionally, it aims to explore the underlying mechanisms through which yoga may exert its therapeutic effects on sleep quality, including stress reduction, relaxation, sleep intervals, and overall physical well-being. This research endeavor aims to contribute to a deeper understanding of the role of yoga in insomnia treatment, potentially paving the way for more targeted and effective interventions in this population.

MATERIAL AND METHODS

The study employed a cross-sectional design and was conducted at various healthcare facilities, including the Physiotherapy Outpatient Department at Holy Family Hospital, Benazir Bhutto Hospital, and District Headquarters Hospital in Rawalpindi. Upon approval of the synopsis, the study spanned a duration of four months. A total of 54 participants were included, selected through random sampling techniques to ensure an equal and independent probability of inclusion. Inclusion criteria encompassed adults aged 18 to 65 years who met the diagnostic criteria for insomnia disorder as per the International Classification of Sleep Disorders (ICSD) or the Diagnostic and Statistical Manual of Mental Disorders (DSM). Exclusion criteria aimed to ensure homogeneity of the study population, excluding individuals with severe medical or psychiatric disorders, substance abuse, pregnancy, or recent changes in sleep medication.

The intervention group engaged in a standardized yoga program tailored for insomnia, which comprised gentle yoga postures, controlled breathing techniques, and mindfulness meditation practices. Sessions were conducted twice a week over eight weeks, each lasting 60 minutes. The control group received standard care for insomnia without the structured yoga intervention. Data collection included subjective assessments of sleep quality using validated questionnaires and objective measures obtained through polysomnography.

Statistical analysis was conducted using SPSS version 25.0. Quantitative variables were presented as mean, standard deviation, mode, and median. Independent sample t-tests were applied to compare means between study groups, while repeated measures ANOVA was used for within-group analysis.

Ethical considerations were paramount. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki. Approval was sought from the institutional review board or ethics committee prior to commencement. Informed consent was obtained from all participants, ensuring voluntary participation, privacy, and confidentiality of their data throughout the study. Measures were taken to safeguard participants' rights and ensure a clear understanding of the study's procedures and potential risks and benefits. The ethical integrity of the study was maintained at all stages, from recruitment to data analysis and reporting (Halpern et al., 36).

RESULTS

The study encompassed 54 participants, equally divided between the control group and the yoga group. The age comparison revealed that the control group had a mean age of 25.26 years with a standard deviation of 1.8, whereas the yoga group had a mean age of 26.3 years with a standard deviation of 1.9, indicating a comparable age distribution across both groups (Table 1).

Subjective sleep quality improved significantly in the yoga group. The mean sleep quality score decreased from 2.18 ± 0.66 pre-intervention to 0.92 ± 0.37 post-intervention, demonstrating a substantial reduction in sleep difficulties (Table 2). This improvement was highly significant, with a p-value of 0.0001, underscoring the effectiveness of the yoga intervention. In contrast, the control group, which did not receive the yoga intervention, showed a smaller improvement in sleep quality. The mean sleep quality score in the control group decreased from 2.37 ± 0.48 pre-intervention to 2.03 ± 0.18 post-intervention, with a p-value of 0.0012, indicating a statistically significant change but less pronounced compared to the yoga group (Table 2).

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Further analysis of sleep latency revealed a significant reduction in the yoga group, where the mean sleep latency decreased from 3.00 ± 0.00 pre-intervention to 1.29 ± 0.40 post-intervention, with a highly significant p-value of 0.0002 (Table 2). Conversely, the control group showed a smaller reduction in sleep latency, from 2.44 ± 0.49 pre-intervention to 2.11 ± 0.31 post-intervention, with a p-value of 0.0013, highlighting a statistically significant change but again less marked than in the yoga group (Table 2).

The summary statistics for subjective sleep quality and sleep latency further validate these findings. The pre-intervention average score for sleep quality was 2.185 with a variance of 0.464, which dropped to an average of 0.925 with a variance of 0.1481 post-intervention (Table 3). Similarly, for sleep latency, the pre-intervention average score was 3.000 with no variance, and post-intervention, the average was 1.296 with a variance of 0.216 (Table 3).

The ANOVA results provided further statistical validation. For subjective sleep quality, the between-groups sum of squares (SS) was 21.407, with a mean square (MS) of 21.407 and an F-value of 69.897. The p-value associated with this F-value was 0.0001, confirming the statistical significance of the differences between the yoga and control groups (Table 4). For sleep latency, the between-groups SS was 39.185, with an MS of 39.185 and an F-value of 361.947. The p-value was 0.0002, underscoring the significant differences observed (Table 4).

Table 1: Summary of Participant Characteristics

Variable	Control Group (n=27)	Yoga Group (n=27)
Age	25.26 ± 1.8	26.3 ± 1.9

Table 2: Sleep Quality and Latency Comparison

Variable	Group	Mean ± SD (Pre)	Mean ± SD (Post)	P-Value
Sleep Quality	Yoga	2.18 ± 0.66	0.92 ± 0.37	0.0001
	Control	2.37 ± 0.48	2.03 ± 0.18	0.0012
Sleep Latency	Yoga	3.00 ± 0.00	1.29 ± 0.40	0.0002
	Control	2.44 ± 0.49	2.11 ± 0.31	0.0013

Table 3: Summary Statistics of Sleep Quality and Latency

Groups	Count	Sum	Average	Variance
Sleep Quality Pre	27	59	2.185	0.464
Sleep Quality Post	27	25	0.925	0.1481
Sleep Latency Pre	27	81	3.000	0.000
Sleep Latency Post	27	35	1.296	0.216

Table 4: ANOVA Results

Source of Variation	SS	df	MS	F	P-value	F crit
Sleep Quality Between	21.407	1	21.407	69.897	0.0001	4.026
Sleep Quality Within	15.924	52	0.306			
Sleep Quality Total	37.333	53				
Sleep Latency Between	39.185	1	39.185	361.947	0.0002	4.026
Sleep Latency Within	5.629	52	0.1082			
Sleep Latency Total	44.814	53				

Table 5: Summary Statistics of Control Group Variables

Variable	Count	Sum	Average	Variance
Subjective Sleep Quality	27	55	2.037	0.037
Sleep Latency	27	57	2.111	0.103
Sleep Duration	27	49	1.815	0.234
Habitual Sleep Efficiency	27	55	2.037	0.345
Column 5	27	54	2.000	0.077
Sleep Medication	27	48	1.778	0.487
Daytime Dysfunction	27	52	1.926	0.917

Table 6: ANOVA for Control Group

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2.476	6	0.413	1.313	0.253	2.149
Within Groups	57.185	182	0.314			
Total	59.661	188				

Table 7: Summary Statistics of Pre-Yoga Group Variables

Variable	Count	Sum	Average	Variance
Subjective Sleep Quality	27	59	2.185	0.464
Sleep Latency	27	81	3.000	0.000
Sleep Duration	27	50	1.852	0.516
Habitual Sleep Efficiency	27	73	2.704	0.370
Column 5	27	59	2.185	0.387
Sleep Medication	27	51	1.889	0.564
Daytime Dysfunction	27	73	2.704	0.524

Table 8: ANOVA for Pre-Yoga Group

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	32.053	6	5.342	13.232	0.000	2.149
Within Groups	73.481	182	0.404			
Total	105.534	188				

Table 9: Summary Statistics of Post-Yoga Group Variables

Variable	Count	Sum	Average	Variance
Subjective Sleep Quality	27	25	0.926	0.148
Sleep Latency	27	35	1.296	0.217
Sleep Duration	27	41	1.519	0.413
Habitual Sleep Efficiency	27	67	2.481	0.336
Column 5	27	27	1.000	0.077
Sleep Medication	27	14	0.519	0.259
Daytime Dysfunction	27	51	1.889	0.333

Table 10: ANOVA for Post-Yoga Group

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	69.960	6	11.650	45.763	7.02E-34	2.149
Within Groups	46.370	182	0.255			
Total	116.330	188				

In the control group, various sleep parameters were analyzed. Subjective sleep quality had an average score of 2.037 with a variance of 0.037. Sleep latency averaged 2.111 with a variance of 0.103. Sleep duration and habitual sleep efficiency had averages of 1.815 and 2.037, with variances of 0.234 and 0.345, respectively. Other variables such as sleep medication and daytime dysfunction had averages of 1.778 and 1.926, with variances of 0.487 and 0.917, respectively (Table 5). The ANOVA for the control group showed no significant differences between these variables, with a between-groups SS of 2.476, an MS of 0.413, an F-value of 1.313, and a p-value of 0.253 (Table 6).

In the pre-yoga group, subjective sleep quality had an average score of 2.185 with a variance of 0.464, while sleep latency averaged 3.000 with no variance. Other parameters such as sleep duration and habitual sleep efficiency had averages of 1.852 and 2.704, with variances of 0.516 and 0.370, respectively. Sleep medication and daytime dysfunction had averages of 1.889 and 2.704, with variances of 0.564 and 0.524, respectively (Table 7). The ANOVA for the pre-yoga group revealed significant differences, with a between-groups SS of 32.053, an MS of 5.342, an F-value of 13.232, and a p-value of 0.000 (Table 8).

Post-yoga intervention, subjective sleep quality averaged 0.926 with a variance of 0.148. Sleep latency averaged 1.296 with a variance of 0.217. Sleep duration and habitual sleep efficiency had averages of 1.519 and 2.481, with variances of 0.413 and 0.336, respectively. Other parameters such as sleep medication and daytime dysfunction had averages of 0.519 and 1.889, with variances of 0.259 and 0.333, respectively (Table 9). The ANOVA for the post-yoga group confirmed significant improvements, with a between-groups SS of 69.960, an MS of 11.650, an F-value of 45.763, and a p-value of 7.02E-34 (Table 10).

Overall, the findings demonstrate that a structured yoga program significantly improves subjective sleep quality and reduces sleep latency in adults with insomnia. The numerical data provide robust support for the effectiveness of yoga as an alternative therapeutic approach, offering compelling evidence for its inclusion in insomnia treatment protocols. The marked improvements observed in the yoga group, as compared to the control group, highlight the potential of yoga to address sleep disturbances and enhance overall well-being.

DISCUSSION

Insomnia is a prevalent condition linked to numerous health complications such as high blood pressure, heart disease, diabetes, anxiety, and depression. Various studies have investigated potential treatments for insomnia, highlighting the importance of non-pharmacological methods for long-term management. For instance, Penders (2021) explored the effects of cognitive behavioral therapy and sedative hypnotics on insomnia, noting the necessity of alternative interventions for sustained benefits. In a pre- and post-intervention quality improvement experiment, four weeks of yoga were tested to assess reductions in insomnia, anxiety, and medication usage. Participants received conventional cognitive behavioral therapy for insomnia and, if their symptoms persisted, engaged in virtual yoga sessions twice to three times weekly. Seven out of eight participants completed the program, attending all 60-minute sessions. After four weeks, sleep latency improved by 35 minutes (a 49% improvement), and sleep duration increased by 1.07 hours (an 18.83% change). Five participants exhibited sub-threshold insomnia, while two had no clinically significant insomnia post-intervention, improving their Insomnia Severity Index (ISI) scores. Anxiety levels also decreased, with State subscale scores of the State-Trait Anxiety Inventory (STAI) improving from a median of 29 to 19, and Trait subscale scores showing a slight improvement from 23.71 to 20.29. However, there was no significant change in medication dosage or frequency post-intervention, indicating that yoga effectively reduced insomnia and anxiety (Penders, 2021).

Similarly, Basavegowda et al. (2023) examined the impact of a workplace yoga intervention on insomnia severity and quality of life (QoL) among female nurses and healthcare workers during the COVID-19 pandemic. This pre–post-interventional study included 173 hospital nurses, with 57 experiencing insomnia. Those without significant insomnia reported higher QoL scores ($P < 0.001$). The six-week workplace yoga intervention, conducted by trained experts, significantly reduced insomnia severity in both subthreshold and moderate clinical insomnia groups ($P < 0.001$). Additionally, the intervention notably improved QoL ratings in the physical, psychological, and environmental dimensions ($P < 0.05$), suggesting that customized workplace yoga programs could enhance healthcare professionals' well-being and resilience, thereby improving work environments and patient outcomes (Basavegowda et al., 2023). Despite its well-documented procedure, the long-term effectiveness of yoga in treating persistent insomnia remains uncertain (Penders, 2021).

The current study significantly contributed to the growing body of evidence supporting yoga as a beneficial intervention for improving sleep quality. By demonstrating marked improvements in subjective sleep quality and sleep latency among participants, the study underscored the potential of yoga to serve as an alternative treatment for insomnia. However, the study had several limitations. The small sample size limited the generalizability of the findings. Additionally, no previous treatments were considered in either group, and there was no long-term follow-up procedure, potentially impacting the sustainability of the observed benefits. Residual confounding due to unassessed or insufficiently quantified factors could not be ruled out, and the study may have experienced participant bias as it required data collection over an extended period while participants were at home. Furthermore, the inherent risks of measurement inaccuracy and misclassification in self-reported physical activity assessments were notable constraints. Conditions like obstructive sleep apnea and restless legs syndrome, which are associated with increased medical complications and mortality, were not accounted for. The small number of instances in several categories of insomnia related to sleep length also made it challenging to ascertain the strength of associations and the reliability of risk assessments (Penders, 2021; Basavegowda et al., 2023).

Future research should focus on comparing the long-term effects of insomnia treatments and investigating the immediate impacts of neural mobilizations in lower limb radiculopathy. Studies with larger sample sizes and extended follow-up periods are necessary to validate these findings. Despite these limitations, the study provided valuable insights into the efficacy of yoga as a therapeutic intervention for insomnia, highlighting its potential to improve sleep quality and reduce associated symptoms, ultimately contributing to better overall health and well-being.

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CONCLUSION

Yoga significantly improved sleep quality and reduced sleep latency in adults with insomnia, underscoring its potential as an effective non-pharmacological treatment. These findings suggest that incorporating yoga into treatment protocols for insomnia can enhance patient outcomes, reduce reliance on medication, and improve overall health and well-being, thereby offering a promising intervention for long-term management of sleep disorders in healthcare settings.

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