



THE IMPACT OF PHYSIOTHERAPY INTERVENTION ON SLEEP QUALITY IN INSOMNIA: AN EXPERIMENTAL CLINICAL TRIAL

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Abstract: **Background:** Humans spend a third of their life sleeping. Quality sleep is critical for proper functioning of the body. Busy lifestyle, more usage of technology, bad food habits, stress leads to disturbed sleep. Insomnia is one of the most common sleep disorders, in which a person is having difficulty falling asleep, staying asleep or having unrefreshing sleep despite having ample opportunity to sleep. Yoga, meditation, exercise is beneficial for insomnia in which, exercise plays an important role in improving sleep quality. Need of the study is to develop subject specific structural exercise protocol according to the severity of insomnia.

Aim: To evaluate the effect of physiotherapy intervention on sleep quality in subjects with Subthreshold Insomnia.

Materials and Methods: Total 30 subjects (25-65 years both male and female) having insomnia Severity Index score between 8 to 14, participated in the study. After taking consent, they were selected according to Insomnia according to (ISI). Group A= Subthreshold insomnia. Sleep quality was measured by (PSQI) and Sleep diary was explained to the participants. Sleep hygiene education was given, and moderate intensity interval exercises were given for 4 days/week for 4 weeks. 1st session was supervised and rest of all were self-performed at home in the evening after 5 pm. Follow-up was taken at the end of 3rd week and 4th week.

Results: Statistical analysis was done using SPSS version 21. Intragroup analysis was done using Repeated measures ANOVA test for group A which shows significant improvement that is p value < 0.05 for ISI & PSQI.

Conclusion: Exercise intensity, frequency and duration remains key factor for designing physical and functional exercises to have impact on subthreshold insomnia. Severity based exercise program should be taken into consideration and opens a new practice for Physiotherapists in people with insomnia.

Index Terms – Aerobic Exercise, Sleep Quality, Insomnia.

I. INTRODUCTION

Humans spend a third of their life sleeping. Sleep is a physical and psychological need for all human beings. Sleep is the natural periodic state of rest for mind and body with closed eyes characterized by partial or complete loss of consciousness.^[1] Good amount of sleep is necessary for proper functioning of human body including immune system, tissue healing, pain modulation, cardiovascular health, cognitive function, memory and learning.

Demanding lifestyle, bad food habits, more use of electronics, smoking, alcohol consumption, stress, work shift etc. disturbs the normal sleep pattern. Healthy individuals (age 30-70 years) who sleep less than 6 hours or more than 8 hours each night had a higher risk for mortality compared with those with adequate sleep (6-8 hours)^[2].

In past, reduced sleep time was believed to be increased productivity but now quality sleep is more prioritized. ^[1] Getting insufficient sleep has been associated with major health problems like obesity, type 2 Diabetes, cardiovascular disease, depression and accidents. Sleeping 7-8 hours has been associated with lower risk of morbidity and mortality.

Quality sleep is how healthy a person sleeps and recognized as positive health behaviour. Sleep disturbance hampers all the functions of the body which leads to anxiety, depression, reduced work performance and further compromises activities of daily living. Lifestyle changes, work profile, food habits, personal stress, leisure activities have a huge impact on sleep pattern which leads to sleep related disorders (SRDs). Nearly one fifth of healthy and productive age group has SRDs in Indian population. ^[3] Most commonly reported sleep disorders are Insomnia, sleep apnea and restless leg syndrome in adults. ^[1]

As per diagnostic and statistical manual of mental disorders (DSM-5), Insomnia can be defined as having trouble falling asleep/ staying asleep or having unrefreshing sleep despite having enough opportunity to sleep associated with daytime functioning present for at least 4 weeks. ^[16] Insomnia leads to depressed or irritable mood, decreased concentration, daytime sleepiness or physical malaise. Worldwide prevalence of insomnia varies from 10% to 40% among general population. In north India, prevalence of insomnia in adults is 12.8% ^[4] In south India, it is 18.6% in healthy adults.

Screening of SRDs can be objectively by Polysomnography (PSG), Multiple sleep latency test (MSLT) Electroencephalography (EEG), etc. These tools are mostly time consuming and cost effective so self-reported questionnaires are most commonly used to assess sleep quality and daytime sleepiness. Two most Widely used questionnaires are Insomnia Severity Index (ISI) and Pittsburgh Sleep Quality Index (PSQI).

ISI is 7 item self-reported questionnaire designed to assess severity of daytime and night-time components of insomnia ^[5] Total score can be interpreted as: absence of insomnia (0-7), sub-threshold insomnia (8-14), moderate insomnia (15-21), severe insomnia (22-28).

PSQI is 19 item questionnaires used to evaluate subjective sleep quality and sleep disturbance over the past month. Seven components are assessed to gain the global PSQI score. Score >5 suggests poor sleep quality. ^[6]

There are many pharmacological and nonpharmacological treatment approaches for insomnia such as medication, relaxation therapy, cognitive behavioral therapy, sleep restriction therapy, exercise, etc. ^[2]

Exercise and sleep quality

Exercise and sleep have a huge impact on each other through both physiological and psychological pathways. ^[14] Sleep is most frequently altered especially in individuals with neurological involvements like stroke, Parkinson's disease, Alzheimer's disease, multiple sclerosis, spinal cord injury, which is most treated by Physiotherapists. SDs may impact their ability to learn and significantly influence the recovery. It is recommended that PTs should screen the sleep quality regularly and provide appropriate exercise program, sleep hygiene education, proper positioning to delay the sequel associated with chronic conditions and promote health and wellness.

Exercise is planned, structured activity that defined by its frequency, intensity, and duration. Regular, planned, and scheduled exercise leads to energy conservation, body restoration and thermoregulatory functions.

Benefits of regular exercise in sleep disorders ^[14,15]:

- Rise in body temperature followed by compensatory drop after few hours makes it easier to fall asleep.
- Acts like physical stressor to the body and Brain compensates by increasing deep sleep.
- Increase flexibility and stretching of muscles leads to release the endorphins.
- Improves lung capacity which reduces the snoring thereby having sound sleep.
- Increased amount of Oxygen reaching to the blood improves the sleep quality.
- Balanced and toned Skeletal muscles as well as Respiratory muscles reduces Sleep apnea and Restless leg syndrome.
- Activates endocrine system and helps to maintain circadian rhythm and reduces hormonal imbalance.

As per the severity of insomnia, exercise should be planned for a subject to improve the sleep quality that's why the study is being conducted to see the effect of moderate intensity interval exercise on sleep quality in subjects with subthreshold insomnia.

METHODOLOGY: Total 30 subjects (25-65 years both male and female) having insomnia Severity Index score between 8 to 14, participated in the study. After taking consent, they were selected according to Insomnia according to (ISI). Group A= Subthreshold insomnia. Sleep quality was measured by (PSQI) and Sleep diary was explained to the participants. Sleep hygiene education was given, and moderate intensity interval exercises were given for 4 days/week for 4 weeks. 1st session was supervised and rest of all were self-performed at home in the evening after 5 pm. Follow-up was taken at the end of 3rd week and 4th week.

RESULTS: Total 30 subjects were enrolled for study in which group A- Subthreshold insomnia, they were given 4 weeks of intervention.

STATISTICAL ANALYSIS: Statistical analysis was done using SPSS version 21 and Microsoft excel used to generate graphs and table. Variables was assessed for normality using shapiro wilk test, Kolmogorov Smirnov test and Q-Q plot. Intragroup analysis was done using Repeated measures ANOVA test for group A. The level of significance was considered < 0.05 , confidence interval was kept 95%

Table 1 Intragroup mean comparison of ISI

| TIME | Group A (ISI) | |
|-----------------------------|---------------|-------|
| | Mean | ± SD |
| Day 1 | 11.1 | ±1.93 |
| End of 3 rd Week | 8.8 | ±3.06 |
| End of 4 th Week | 6.03 | ±1.80 |

Table 2 Intragroup mean comparison of PSQI

| TIME | Group A (PSQI) | |
|-----------------------------|----------------|-------|
| | Mean | ± SD |
| Day 1 | 9.96 | ±2.70 |
| End of 3 rd Week | 8.03 | ±2.81 |
| End of 4 th Week | 6.56 | ±2.09 |

Table 3 Pairwise comparison of ISI & PSQI

| Time (I) | Time (J) | Group A (ISI) | | Group A (PSQI) | |
|-----------------------------|-----------------------------|-----------------|---------|-----------------|---------|
| | | Mean difference | p value | Mean difference | p value |
| Day 1 | End of 3 rd week | 2.267 | 0.000 | 1.993 | 0.000 |
| Day 1 | End of 4 th week | 5.06 | 0.000 | 3.400 | 0.000 |
| End of 3 rd week | End of 4 th week | 2.800 | 0.000 | 1.467 | 0.000 |

In table 3, Wilk's lambda < 0.05 and p value < 0.05 suggests statistically significant improvement in ISI and PSQI after intervention in group A.

DISCUSSION: Aim of the study was to evaluate the effect of physiotherapy intervention on sleep quality in subjects having subthreshold insomnia. In this study 30 subjects with insomnia, age between 25 to 65 years included with Subthreshold Insomnia and moderate intensity interval exercise was given with different repetition and different timing according to subject's need for 4 days/week till 4 weeks. Result shows effectiveness of exercise on ISI and PSQI. So, sleep quality was improved in subthreshold insomnia. Exercise influence sleep characteristics in many complex interactions and in every human being the reason behind altering the sleep quality may be different so mechanism for improving sleep quality may also differ from subject to subject.

Exercise raises body temperature which triggers heat loss mechanism and thereby reducing the post exercise temperature which improves circadian rhythm and improves sleep quality.^{1,32}

Regular exercise may promote vascularization in the body and enhances nutrient supply to the brain which may be considered as nonpharmacological intervention to bring vascular, cognitive, and neuro-motor benefits to the subjects with insomnia¹¹.

Exercise increases adenosine levels in the body and induce positive changes in circadian rhythm. These changes have positive effect in regulating sleep and preserving energy of the body⁸ in addition to it, adequate secretion of growth hormone during sleep helps in reserving the resources of the body and prevents decrease in performance over day and improve sleep quality.¹⁴

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