



**ORIGINAL RESEARCH PAPER**

**Respiratory Medicine**

**EFFECT OF PULMONARY REHABILITATION ON SLEEP QUALITY IN DIAGNOSED ILD PATIENTS**

**KEY WORDS:** Pulmonary Rehabilitation, ILD, sleep quality, PSQI Score.

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**ABSTRACT**  
**Aims And Objectives** To evaluate the effect of pulmonary rehabilitation on sleep quality in patients with interstitial lung diseases using Pittsburgh Sleep Quality Index (PSQI) score. **Materials And Methods** The study was conducted in the Department of Respiratory Medicine, M.M. Institute of Medical Sciences and Research, Mullana. Patients with ILD who visited the Department of Respiratory Medicine were taken into consideration. **Results** The mean Global Pittsburgh Sleep Quality Index (PSQI) Score before pulmonary rehabilitation was 9.45 + 2.80, while after pulmonary rehabilitation was 7.45 + 3.64, meaning sleep quality improved. **Conclusion** From this study, it can be concluded that there is a high prevalence of poor sleep quality in patients with ILD referred for pulmonary rehabilitation and this is independently associated with increasing symptoms of sleepiness. Patients with ILDs achieve significant gains in exercise capacity regardless of disease severity. Pulmonary rehabilitation should be considered as a standard of care for patients with ILD.

**INTRODUCTION**

Interstitial lung disease (ILD) is a broad term that includes more than two hundred conditions that are associated with widespread inflammation and or fibrosis of the interstitium of the lungs.<sup>1</sup> Progressive exertional dyspnoea, non-productive cough, distinctive imaging abnormalities and restrictive lung function tests are some of the pathognomonic clinical features of ILD. All three features may not be present together at the time of presentation as it depends on the stage of the disease process.

The quality of sleep is regarded as one's satisfaction with the sleep experience, which includes aspects including initiation, sleep maintenance, the quantity of sleep, and refreshment upon waking up. Essentially, good sleep is critical to both physical and mental well-being.<sup>2</sup>

Sleep and respiratory diseases interact strongly, which leads to permissive sleep effects on respiratory failure and mucous retention. Similarly, respiratory diseases have a negative effect on sleep continuity and quality.<sup>3</sup>

Pittsburgh Sleep Quality Index was used to assess the quality of sleep (PSQI). The 19-item PSQI is a globally recognized assessment of sleep quality over the preceding 1-month time period. It can be divided into 7 components that evaluate various aspects of sleep quality: subjective sleep quality; latency, duration, efficiency, and disturbances of sleep; use of sleep medication; and daytime dysfunction. The global PSQI score has a range of 0 to 21, with higher scores indicating worse sleep quality. PSQI >5 is generally considered to be an indicator of poor sleep quality.<sup>3</sup>

Pulmonary rehabilitation (PR) is a “comprehensive intervention based on a thorough patient evaluation followed by patient-tailored therapies that include but are not limited to exercise training, education, and behavior change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to

promote the long-term adherence to health-enhancing behaviors” as per the official American Thoracic Society/ European Respiratory Society statement.<sup>4</sup>

Although there is little published information on effect of pulmonary rehabilitation on sleep quality in ILD patients, sleep-related disturbances were studied in other chronic lung conditions like COPD and most of the data from specialised teaching centres with inpatient setups and similar results can be achieved in other chronic lung diseases like ILD.

**AIMS AND OBJECTIVES**

To evaluate the effect of pulmonary rehabilitation on sleep quality in patients with interstitial lung diseases using Pittsburgh Sleep Quality Index (PSQI) score.

**MATERIALS AND METHODS**

The study was conducted in the Department of Respiratory Medicine, M.M. Institute of Medical Sciences and Research, Mullana. Patients with ILD who visited the Department of Respiratory Medicine were taken into consideration.

After getting approval from the Institutional Ethical Committee (IEC Project number:2013) patients were recruited from the Respiratory Medicine OPD and ward M.M. Institute of Medical Sciences and Research, Mullana, MMU (Deemed to be University) on the basis of selection criteria. In this study, both females and males of the age group 35 to 70 years diagnosed with interstitial lung disease in accordance with ATS/ERS guidelines were recruited. The written informed consent form was obtained from all patients for voluntary participation. All patient's demographic characteristics such as name, age(year), gender, height(cm), and BMI (kg/m<sup>2</sup>) were noted and their detailed medical history was recorded in proforma.

The pulmonary rehabilitation consists of aerobic (treadmill, stationary bike, or similar apparatus) and resistance (light

weights, resistance bands, or machines) training; and instruction on breathing techniques (pursed-lipped, controlled, and diaphragmatic breathing), pacing, and energy conservation.

Based on the patient's status and assessed ability, exercise regimens were individualized. The training portion consisted of sessions on nutrition, psychosocial support, medications, oxygen use and relaxation.

The criteria for selecting the individuals were specified and have been given below.

**Inclusion Criteria**

- Patient diagnosed with Interstitial lung disease
- Age group 35 to 70 years
- Both male and female
- All cases of mild to moderate dyspnea (mMRC grade 0-3) coming to OPD and IPD

**Exclusion Criteria**

- Cardiac events within past 6 weeks
- Sputum positive pulmonary tuberculosis patients
- Known active covid-19 positive patients
- Severe dyspnea (mMRC grade 4)
- Any other disorders causing dyspnea (like severe anemia, pleural effusion, Obstructive Airway Diseases, thyroid disorders etc.)
- Surgical history within 6months

Pulmonary rehabilitation was delivered by a physiotherapist. For the patient's nutritional needs, a dietician's consultation was obtained and a diet chart was given to the patients.

Patients were followed up in OPD after 4 weeks. At the end of the study i.e., after 4 weeks, patients pre-rehabilitation results were compared to the post-rehabilitation results.

**RESULTS**

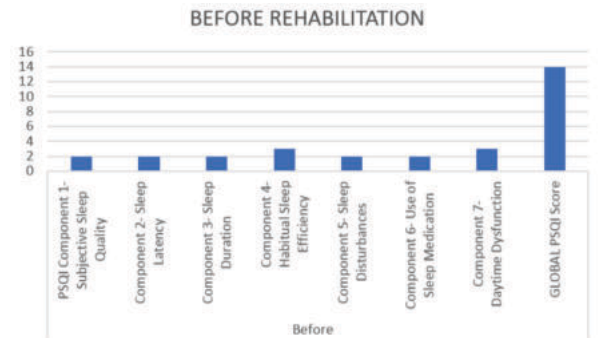
A total of 11 patients comprising 6 females and 5 males were studied with a mean age of 58.2 years. Mean BMI of patients is 22.03 Kg/m<sup>2</sup>.

**Table 1 : All the components of PSQI scale and overall Global PSQI score before and after Comprehensive Pulmonary Rehabilitation and their mean values.**

		N	Mini mum	Maxim um	Mean	Std. Devia tion
Befo re	PSQI Component 1- Subjective Sleep Quality	11	0.00	2.00	1.45	0.68
	Component 2- Sleep Latency	11	0.00	2.00	1.54	0.68
	Component 3- Sleep Duration	11	0.00	2.00	1.64	0.67
	Component 4- Habitual Sleep Efficiency	11	0.00	3.00	1.54	0.82
	Component 5- Sleep Disturbances	11	0.00	2.00	1.55	0.68
	Component 6- Use of Sleep Medication	11	0.00	2.00	0.3	0.64
	Component 7- Daytime Dysfunction	11	0.00	3.00	1.72	0.64
	GLOBAL PSQI Score	11	5.00	14.00	9.45	2.80
Afte r	PSQI Component 1- Subjective Sleep Quality	11	0.00	2.00	0.63	0.67
	Component 2- Sleep Latency	11	0.00	2.00	1.18	0.75

Component 3- Sleep Duration	11	0.00	2.00	1.27	0.64
Component 4- Habitual Sleep Efficiency	11	0.00	3.00	1.36	1.02
Component 5- Sleep Disturbances	11	0.00	3.00	1.45	0.82
Component 6- Use of Sleep Medication	11	0.00	1.00	0.18	0.40
Component 7- Daytime Dysfunction	11	0.00	2.00	1.4	0.67
GLOBAL PSQI Score	11	4.00	15.00	7.45	3.64

Components of PSQI scale which were improved were Subjective sleep quality, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications and day time dysfunction.



**Graph 1 - Pittsburgh Sleep Quality Index Scores Before Rehabilitation**



**Graph 2 - Pittsburgh Sleep Quality Index Scores After Rehabilitation**

**Table 2 : Global PSQI Score before and after Comprehensive Rehabilitation**

	Before		After		p-value	Difference	
	Mean	SD	Mean	SD		Mean	SD
GLOBAL PSQI Score	9.45	2.80	7.45	3.64	0.1641	2.00	0.84

Mean Global Pittsburgh Sleep Quality Index (PSQI) Score before rehabilitation was 9.45 ± 2.80, while after rehabilitation was 7.45 ± 3.64 which means sleep quality was improved but still all patients are in poor sleeper category i.e., Global PSQI score <5.

**DISCUSSION**

PSQI – Pittsburgh Sleep Quality Index was developed by Daniel J. Buysse and collaborators to measure the quality of sleep and to help discriminate between individuals who experience poor sleep versus individuals who sleep well. It has several domains, which include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The scale has two parts: 19 self-rated questions, utilized to rate the scale, and five questions rated by a bed partner. The scale can also be given by a clinician or research

assistant. Most of the items are organized in multiple choice questions and are brief and easy to understand and answer. The PSQI questions are rated from 0 = no difficulty to 3 = severe from 0 to 21 and the authors suggest that a score >5 be considered as a significant sleep disturbance. Time to complete PSQI scale: 5–10 min. The reliability of the scale is considered good with Cronbach's alpha of 0.83 for the total score. Test–retest reliability is also considered good.<sup>3</sup>

The validity of PSQI has been described by the authors as good with a sensitivity of 89.6% and a specificity of 86.5% of patients versus control subjects.

Prior studies evaluating sleep quality in patients with ILD using the global PSQI score have shown elevated mean PSQI values. Our findings differ from previous studies in that we have not only looked at the total PSQI score, but also evaluated the individual domains making up the PSQI as well as the subjective sleep duration and sleep latency times, allowing for a better understanding of the poor sleep quality. In this current study, mean PSQI score was  $9.45 \pm 2.80$  before rehabilitation which was reduced to  $7.45 \pm 3.60$ . The mean difference found was  $2.00 \pm 0.84$ . In a recent study of 34 IPF patients, median PSQI was 5 units but a subgroup with OSA and sleep-related hypoxemia had an elevated median PSQI at 8.5 units.<sup>5</sup>

Current study results were also consistent with published data, including a cross-sectional study of 41 patients demonstrating a mean PSQI of  $6.3 \pm 3.7$ ,<sup>6</sup> 15 patients with a mean PSQI of  $9.8 \pm 2.3$ <sup>7</sup> and 52 patients with a mean PSQI of  $7.0 \pm 3.9$ .<sup>8</sup>

We have mentioned many studies of pulmonary rehabilitation in interstitial lung disease published in the past years.<sup>9-19</sup> Some of these studies were randomized controlled trials.<sup>10-12</sup> The results of all the studies have been remarkably consistent. The largest study found a mean improvement in 6-min walk distance of 56 mt and suggested that subjects with a worse baseline walk distance experienced greater benefit.<sup>11</sup> These findings support the comment that patients with worse disease may benefit more.<sup>20</sup> Taken together, these and other previous studies provide a solid evidence base for pulmonary rehabilitation in interstitial lung disease. Currently, there are no proven effective pharmacologic therapies for many patients with interstitial lung disease. Such patients, however, can still benefit from pulmonary rehabilitation. Reduced activity levels because of dyspnea and misconceptions about the safety of exercise can lead to cardiovascular and peripheral muscle deconditioning, as seen in Salhi et al<sup>14</sup> we agree with the hypothesis that pulmonary rehabilitation exerts its effect on these non-pulmonary limitations to exercise.

**CONCLUSION**

From this study, it can be concluded that there is a high prevalence of poor sleep quality in patients with ILD referred for pulmonary rehabilitation and this is independently associated with increasing symptoms sleepiness. Patients with ILDs achieve significant gains in exercise capacity regardless of disease severity. Pulmonary rehabilitation should be considered as a standard of care for patients with ILD.

**Statement Of Ethics**

Institutional Ethical Committee, Informed consent was obtained from the patients.

**Conflict Of Interest**

The authors of this article do not have any conflict of interest to declare.

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