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# Assessment Of Sleep Quality and Its Impact on Health-Related Quality of Life in Treated Tuberculosis Patients in A Tertiary Care Centre, Chengalpattu District

**J.Sam Selva Shruthi[1*], Aruna Shanmuganathan[2], A. Chitrakumar[3], Rohita S[4], M. Shandya[5]**

[1]*Department of Respiratory Medicine, Karpaga Vinayaga Institute of Medical Sciences and Research Center. P.O, GST Road, Chinna Kolambakkam, Palayanoor, Maduranthakam- 603 308, Tamilnadu, India.

Orcid ID: 0009-0001-0608-6277

[2]Department of Respiratory Medicine, Karpaga Vinayaga Institute of Medical Sciences and Research Center. P.O, GST Road, Chinna Kolambakkam, Palayanoor, Maduranthakam- 603 308, Tamilnadu, India.

Orcid ID: 0000-0002-4942-6366

[3]Department of Respiratory Medicine, Karpaga Vinayaga Institute of Medical Sciences and Research Center. P.O, GST Road, Chinna Kolambakkam, Palayanoor, Maduranthakam- 603 308, Tamilnadu, India.

Orcid ID: 0000-0001-6775-0402

[4]Department of Respiratory Medicine, Karpaga Vinayaga Institute of Medical Sciences and Research Center. P.O, GST Road, Chinna Kolambakkam, Palayanoor, Maduranthakam- 603 308, Tamilnadu, India.

Orcid ID: 0009-0001-9883-2651

[5]Department of Respiratory Medicine, Karpaga Vinayaga Institute of Medical Sciences and Research Center. P.O, GST Road, Chinna Kolambakkam, Palayanoor, Maduranthakam- 603 308, Tamilnadu, India.

Orcid ID: 0009-0003-7989-0957

***Corresponding Author:**

Dr. J. Sam Selva Shruthi

*M. D Postgraduate Department of Respiratory Medicine Karpaga Vinayaga Institute of Medical Sciences and Research Center P.O, GST Road, Chinna Kolambakkam, Palayanoor, Maduranthakam- 603 308, Tamilnadu, India

Email ID: shruthijustin108@gmail.com

Orcid ID: 0009-0001-0608-6277

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## ABSTRACT

**Introduction:** Tuberculosis (TB) can cause persistent symptoms, such as sleep disturbances, even after treatment, significantly reducing the patient's quality of life. As good sleep is vital for overall health, early identification and management of poor sleep quality are essential for improving long-term outcomes in TB survivors.

**Aim:** To determine the sleep quality among treated TB patients and to assess its impact on health-related quality of life in a tertiary care centre.

**Methods**: A cross-sectional study was conducted involving 60 patients with pulmonary and extrapulmonary TB who completed ATT for 6 months. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), and HRQoL was evaluated using the SF-36 Questionnaire. Statistical analyses were performed to determine the correlation between PSQI scores and various HRQoL domains.

**Results:**The mean age was 39.7 years, and 61.7% of patients were male. No significant sex differences were observed ($p = 0.254$). A total of 35% had poor sleep quality (PSQI > 5), which was significantly more common in those aged > 50 years ($p = 0.007$). Poor sleepers had notably worse scores in pain, general health, energy/fatigue, and physical functioning (all $p < 0.05$), with strong negative correlations between PSQI and pain ($r = -0.794$), physical functioning ($r = -0.669$), and energy/fatigue ($r = -0.635$) scores.

**Conclusion:** Sleep disturbances are common among Treated TB patients and are strongly associated with a reduced quality of life. Integrating routine sleep quality screening and psychosocial support into post-treatment care may improve long-term outcomes for TB survivors.

**Keywords:** *Tuberculosis, Sleep quality, Health-related quality of life, Pittsburgh Sleep Quality Index, SF-36 Questionnaire.*

## 1. INTRODUCTION

Globally, Tuberculosis (TB) is one of the leading causes of death. According to the Global TB Report 2024, approximately 10.8 million TB cases are reported annually, with India's incidence contributing to 26% of cases.[1] Under the National Tuberculosis Elimination Programme(NTEP), India has significantly reduced TB incidence and deaths, with a 17.7% decrease in incidence cases from 2015 to 2023.[1] While treatment outcomes have improved, leading to a growing number of TB survivors, many of these patients continue to suffer both physically and mentally, despite being microbiologically cured.

Patients with tuberculosis often have other problems, such as depression and anxiety. These can cause sleep problems, which then affect their physical health and thinking abilities, lowering their overall quality of life[2]. Sleep is a critical determinant of overall health, exerting significant effects on cardiometabolic regulation and immune function, which in turn influence vulnerability to infectious diseases. In the Indian population, the prevalence of sleep disorders is notable, with obstructive sleep apnea (OSA) affecting approximately 11% of adults, insomnia reported in 13–38%, and restless legs syndrome (RLS) observed in 2–12% of individuals.[4]

Sleep disturbances have been observed to negatively impact the quality of life in TB patients, even during treatment. Studies show that approximately 45–75% of patients treated for pulmonary TB suffer from varying degrees of long-term complications and functional limitations, which can lead to both physical and psychological difficulties.[5] The worsening in sleep quality among these patients may be attributed to residual health issues or the persistent fear of disease recurrence, both of which can further diminish overall well-being.[6] Although previous studies have highlighted the impact of post-TB complications on Health-Related Quality of Life (HRQoL), the specific role of sleep quality during follow-up has not been thoroughly investigated.[7,8]

The quality of life among patients with Treated TB in the study region was notably poor, with limited research conducted on this aspect. Implementing structured counselling interventions, offering financial support through targeted social welfare packages, and addressing modifiable factors that disrupt sleep may enhance patients' disease acceptance during treatment and contribute to improvements in their overall quality of life.[9] In light of this gap, the present study sought to analyse the influence of sleep quality on HRQoL in patients with both pulmonary and extrapulmonary TB who have completed their treatment. Aim of the study to determine the sleep quality among treated TB patients and to assess its impact on health-related quality of life in a tertiary care centre

## 2. MATERIALS AND METHODS

A cross-sectional study was conducted in the Department of Respiratory Medicine at Karpaga Vinayaga Institute of Medical Sciences and Research Centre, Chengalpattu district. The study included 60 patients who completed Anti-tuberculosis treatment (ATT) for TB within two years. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants before enrolment.

### 2.1 Inclusion criteria

Adults >18 years old of all genders with pulmonary and extrapulmonary treated Tuberculosis patients under follow-up within 2 years of completion of anti-TB treatment were included.

### 2.2 Exclusion criteria

Pre-existing neuro-psychiatric disorders, chronic medical conditions causing sleep disorders (such as CKD, CCF, Malignancy, COPD), and patients on medication known to affect sleep quality.

### 2.3 Methods

Each patient completed the SF-36 and PSQI questionnaires. The collected data were documented using a structured proforma and the results were analyzed

### 2.4 SF-36 Questionnaire:

The SF-36 questionnaire was used to evaluate HRQoL, demonstrating high reliability (overall score: 0.80; >0.90 for physical and mental components). It assesses eight domains: physical functioning, bodily pain, energy/fatigue, emotional

well-being, social functioning, general health, and role limitations due to physical or emotional health. Domain scores range from 0 to 100, with scores above 50 indicating better health status.[10,11]

### 2.5 Pittsburgh Sleep Quality Index (PSQI):

The Pittsburgh Sleep Quality Index (PSQI) is a validated tool for assessing sleep quality, with strong internal consistency (Cronbach's alpha = 0.83) and test-retest reliability (r = 0.85). It also showed high diagnostic accuracy, with 89.6% sensitivity and 86.5% specificity. The PSQI comprises seven components, each of which is scored from 0 to 3. The total global score ranges from 0 to 21, with scores above 5 indicating poor sleep quality.[12]

## 3. STATISTICAL ANALYSIS

Data are expressed as the mean ± standard deviation for continuous variables and as frequency and percentage for categorical variables. The association between sleep quality and various domains of HRQoL (SF-36) and comorbidities was analysed using the chi-square test. Statistical significance was set at $p < 0.05$. All statistical analyses were conducted using IBM SPSS, V25.

## 4. RESULTS

Most patients were aged 30–50 years (51.7%), followed by those under 30 (26.7%) and over 50 years (21.7%).Males (61.7 %) predominated over females (38.3%).Based on global sleep scores, good sleepers (score < 5) were more common (65%) than poor sleepers (score > 5; 35%)(Table 1).

Good sleepers were predominantly under 50 years old (38.5% under 30; 48.7% aged 30–50), whereas poor sleep quality was more common among those over 50 (38.1%), with a significant difference (p = 0.007). Although most of the poor sleepers were female (71.4%) compared to males (28.6%) (p = 0.254) (Table 1).

**Table 1: The association between sleep quality with comorbidities(SF 36)**

| | | Global Sleeping Score | | P value |
|---|---|---|---|---|
| | | Good sleepers (n=39) | Poor sleepers (n=21) | |
| Age (years) | < 30 | 15 (38.5%) | 1 (4.8%) | 0.007 |
| | 30-50 | 19 (48.7%) | 12 (57.1%) | |
| | > 50 | 5 (12.8%) | 8 (38.1%) | |
| Gender | Male | 17 (43.6%) | 6 (28.6%) | 0.254 |
| | Female | 22 (56.4%) | 15 (71.4%) | |

The mean global PSQI score was 3.91 ± 4.36 (95% CI: 2.81–5.01). Among the components, the highest mean scores were for sleep duration (1.12 ± 0.84), sleep latency (1.06 ± 0.77), and sleep disturbance (1.05 ± 0.56), followed by daytime dysfunction (0.85 ± 0.87).Lower scores were observed for sleep efficiency (0.38 ± 0.82) and the use of sleep medication (0.20 ± 0.60) (Table 2).

**Table 2. PSQI domains mean**

| | Mean ± SD | CI for mean |
|---|---|---|
| Sleep quality | 0.78±0.88 | 0.55 – 1.00 |
| Sleep latency | 1.06 ±0.77 | 0.86 – 1.25 |
| Sleep duration | 1.12 ±0.84 | 0.91 – 1.33 |
| Sleep efficacy | 0.38 ±0.82 | 0.17 – 0.59 |
| Sleep disturbances | 1.05 ±0.56 | 0.91 – 1.19 |
| Daytime dysfunction | 0.85 ±0.87 | 0.63 – 1.07 |

| | | |
|---|---|---|
| Sleep medication | 0.2 ±0.60 | 0.05 – 0.35 |
| Global score | 3.91 ±4.36 | 2.81 – 5.01 |

Compared to good and poor sleepers, the latter had significantly more issues with fatigue (28.6% vs. 5.1%, p = 0.011), physical functioning (23.8% vs. 5.1%, p = 0.032), pain (66.7% vs. 2.6%, p < 0.001), general health (52.4% vs. 5.1%, p < 0.001), physical health (38than%, p = 0.001), emotional problems (38.1% vs. 5.1%, p = 0.001), and social functioning (52.4% vs. 17.9%, p = 0.006). Emotional well-being showed no significant difference (p = 0.238) (Table 3).

**Table 3: Relationship between sleep quality and quality of life (SF-36)**

| **Outcome Parameters** | | **Global Sleeping Score** | | **P value** |
|---|---|---|---|---|
| | | **Good sleepers (n = 39)** | **Poor sleepers (n = 21)** | |
| Energy/Fatigue | More disability | 2 (5.1%) | 6 (28.6%) | 0.011 |
| | Less disability | 37 (94.9%) | 15 (71.4%) | |
| Physical functioning | More disability | 2 (5.1%) | 5 (23.8%) | 0.032 |
| | Less disability | 37 (94.9%) | 16 (76.2%) | |
| Pain | More disability | 1 (2.6%) | 14 (66.7%) | <0.001 |
| | Less disability | 38 (97.4%) | 21 (33.3%) | |
| General Health | More disability | 2 (5.1%) | 11 (52.4%) | <0.001 |
| | Less disability | 37 (94.9%) | 10 (47.6%) | |
| Physical health | More disability | 2 (5.1%) | 8 (38.1%) | 0.001 |
| | Less disability | 37 (94.9%) | 13 (61.9%) | |
| Emotional problem | More disability | 2 (5.1%) | 8 (38.1%) | 0.001 |
| | Less disability | 37 (94.9%) | 13 (61.9%) | |
| Social functioning | More disability | 7 (17.9%) | 11 (52.4%) | 0.006 |
| | Less disability | 32 (82.1%) | 10 (47.6%) | |
| Emotional well-being | More disability | 1 (2.6%) | 2 (9.5%) | 0.238 |
| | Less disability | 38 (97.4%) | 19 (90.5%) | |

Sleep quality was strongly negatively correlated with pain (r = –0.794), physical functioning (r = –0.669), and energy/fatigue (r = –0.635), indicating that poor sleep was associated with increased pain, reduced energy, and impaired physical function. Similarly, declines in general health (r = –0.663), emotional problems (r = –0.574), and social functioning (r = –0.435) were linked to worsening sleep. All correlations were significant (p < 0.01) (Table 4).

**Table 4. Correlation between sleep quality (PSQI) and quality of life (SF-36)**

| **PSQI with SF 36** | **P value** | **Global score** | **Energy/ Fatigue** | **Physical functioning** | **Pain** | **General Health** | **Physical health** | **Emotional problem** | **Social functioning** | **Emotional well-being** |
|---|---|---|---|---|---|---|---|---|---|---|
| Global score | r | 1 | -.635** | -.669** | -.794** | -.663** | -.586** | -.574** | -.435** | -.447** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | P Value | | 0 | 0 | 0 | 0 | 0 | 0 | 0.001 | 0 |
| Energy/Fatigue | r | -.635** | 1 | .741** | .681** | .772** | .682** | .558** | .490** | .769** |
| | P Value | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Physical functioning | r | -.669** | .741** | 1 | .733** | .703** | .767** | .674** | .394** | .595** |
| | P Value | 0 | 0 | | 0 | 0 | 0 | 0 | 0.002 | 0 |
| Pain | r | -.794** | .681** | .733** | 1 | .717** | .670** | .660** | .511** | .626** |
| | P Value | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 |
| General health | r | -.663** | .772** | .703** | .717** | 1 | .569** | .534** | .392** | .667** |
| | P Value | 0 | 0 | 0 | 0 | | 0 | 0 | 0.002 | 0 |
| Physical health | r | -.586** | .682** | .767** | .670** | .569** | 1 | .752** | .391** | .512** |
| | P Value | 0 | 0 | 0 | 0 | 0 | | 0 | 0.002 | 0 |
| Emotional problem | r | -.574** | .558** | .674** | .660** | .534** | .752** | 1 | .563** | .530** |
| | P Value | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| Social functioning | r | -.435** | .490** | .394** | .511** | .392** | .391** | .563** | 1 | .612** |
| | P Value | 0.001 | 0 | 0.002 | 0 | 0.002 | 0.002 | 0 | | 0 |
| Emotional well-being | r | -.447** | .769** | .595** | .626** | .667** | .512** | .530** | .612** | 1 |
| | P Value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Total | N | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |

## 5. DISCUSSION

### Demographic data (age and gender)

In our study, 35% of patients with Treated TB exhibited poor sleep quality, as measured by the PSQI, with significant impairments observed across multiple domains of the SF-36 QoL assessment. Our results showed that poor sleep was significantly more common in patients aged > 50 years ($p = 0.007$), but no significant difference was observed between the sexes. This is consistent with the study by **Liu et al.,** who found that 44.9% of patients with TB experienced poor

sleep quality. They also identified older age and psychological distress as significant contributors. Sex distribution did not differ significantly (male: 58.4% in poor sleepers vs. 52.9% in good sleepers, p = 0.254).[13]

Similarly, **Karim et al.,** where older TB patients reported more sleep disturbances and fatigue than younger patients, and although women reported slightly higher rates of poor sleep, the difference between sexes was not significant.[14]

**Mean PSQI score**

In our study, the mean global mean PSQI score among patients with TB was 3.91 ± 4.36. Similarly, **Itagi et al.,** reported a mean global PSQI score of 4.8 ± 2.8 among TB patients, further highlighting the persistent issue of poor sleep quality in this population.[6]

**PSQI components**

Our findings indicate that even among treated patients with TB, residual sleep-related disturbances persist, particularly in domains such as daytime dysfunction and sleep latency. These disturbances may contribute to impaired physical and mental functioning, as reflected by a lower mean global PSQI score (3.91 ± 4.36), highlighting the need for psychosocial support and follow-up care.

In a similar study by **Muniyandi et al.,** the overall physical well-being score (74), mental well-being score (68), and social well-being score (84) were found to be significantly lower among patients with persistent symptoms including sleeping disturbances, females, the unemployed, and the illiterate. These results showed that factors such as literacy, employment, and absence of symptoms were independently associated with better quality of life, aligning with our implication that, although treated, TB patients may continue to experience impaired well-being.[15] In comparison, the **Raj et al.,** study contrasted that reported a lower prevalence of poor sleep and highlighted factors like poor sleep hygiene and restless legs syndrome as key contributors, without examining quality of life correlations.[16]

**Emotional insignificance**

In our study, emotional well-being showed no significant difference (p = 0.238). This is similar to a study by **Dujaili et al.,** who reported that a gradual increase in physical well-being, functional well-being, and emotional well-being/TB subscale scores for TB treatment indicated the positive impact of therapeutic interventions on patient QoL. However, the mean EWB/TB score showed only a marginal increase from 20.54 ± 9.65 at baseline to 20.78 ± 11.04 after 2 months did not significantly differ from baseline.[17]

**Relationship between sleep quality and global sleeping score (pain, physical functions, well-being, etc.)**

In our study, poor sleep quality was significantly more common and was associated with worse scores for pain, general health, energy/fatigue, and physical functioning (all $p < 0.05$). Strong negative correlations between PSQI and pain, physical function, and energy/fatigue highlight the substantial impact of sleep disturbance and QoL. Similarly, **Thoker et al.,** reported impaired QoL in treated TB patients, with activity most affected (mean: 45.47) by factors like sleep disturbances.[18]

**Aggarwal et al.** reported that on assessment of QoL by SGRQ, the average score obtained was 42.3±24.0 (95% CI:37.3-47.3), with 'Symptoms' being the most affected domain. On using SOLQ, 'Treatment satisfaction' (mean score 38.5±21.7, 95% CI:34-43) and 'Physical function' (mean score 66.6±23.7, 95% CI:61.6-71.6) were the most affected.[19] Also, a study by **Zhang et al.,** reported that sleep quality in patients with pulmonary TB was closely related to residual immune dysfunction and significantly influenced patient well-being.[20]

**Nurlaela et al.,** where the physical role domain was the lowest (mean score: 40.24) and over half of TB patients had poor overall quality of life, while emotional support from family emerged as a key factor in better outcomes (p = 0.039).[21] A study by **Malik et al.,** that fatigue, pain, and emotional problems were also more prevalent among poor sleepers, significantly impairing daily functioning and overall well-being.[22]

**Kodical et al.** reported reduced quality of life among patients with TB across all WHOQOL-BREF domains: physical, psychological, social, and environmental. Both studies highlight that tuberculosis, especially when accompanied by poor sleep, leads to a broad decline in overall well-being, highlighting the need for holistic patient care.[23] In contrast, **Atif et al.,** found that pulmonary tuberculosis treatment led to a significant improvement in overall HRQoL over time, particularly in physical and psychological domains, suggesting treatment positively impacts patient well-being.[24]

To the best of our knowledge, there are limited studies from India and none from our region that have specifically examined sleep quality using the PSQI and its correlation with the SF-36 domains among treated TB patients. This lends novelty and contextual relevance to our findings, particularly in highlighting the neglected aspect of the post-treatment psychosocial burden in TB survivors. Limitation of the study its single-point-in-time data collection, which prevents causal conclusions, and its small, single-centre sample size, which restricts the generalisability of the results.Furthermore, reliance on self-reported questionnaires introduces the potential for recall and social desirability biases.

## 6. CONCLUSION

Sleep disturbances are common among with treated tuberculosis patients and are strongly associated with a reduced quality of life, particularly in the physical, pain, and fatigue domains. Older age is a significant risk factor for poor sleep quality, while sex differences are not significant. Routine screening and support for sleep issues should be integrated into post-treatment care to improve the long-term outcomes of TB survivors.

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