

RISK FACTOR ANALYSIS OF OBSTRUCTIVE SLEEP APNEA AND ANXIETY AMONG PATIENTS WITH PULMONARY TUBERCULOSIS AT IBNU SINA HOSPITAL, MAKASSAR

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ABSTRACT

Pulmonary Tuberculosis (TB) is a global health problem that is often accompanied by comorbidities such as Obstructive Sleep Apnea (OSA) and anxiety disorders, which can worsen quality of life and treatment adherence. This study aims to analyze the risk factors of OSA and anxiety, as well as the relationship between the two in pulmonary TB patients at Ibnu Sina Hospital, Makassar. This study employed an observational analytic design with a cross-sectional approach. The sample consisted of 85 pulmonary TB patients selected using a total sampling technique. Data were collected using the STOP-BANG questionnaire to assess the risk of OSA and the GAD-7 questionnaire to measure anxiety levels. Data analysis was conducted using univariate and bivariate methods, with the Chi-Square test at a significance level of $p < 0.05$ using SPSS version 25.0. The majority of respondents were male (51.8%) and belonged to the adult age group (69.4%). The study found proportions of OSA and anxiety among pulmonary TB patients. The analysis showed a significant relationship between age and sex with the incidence of OSA and anxiety. Furthermore, there was a significant association between OSA and anxiety in pulmonary TB patients ($p < 0.05$). There is a significant relationship between OSA and anxiety in pulmonary TB patients. Age and sex are important risk factors; therefore, a comprehensive approach is needed in the management of TB patients.

Keywords : Pulmonary tuberculosis, obstructive sleep apnea, anxiety, risk factors, GAD-7

INTRODUCTION

Pulmonary tuberculosis (TB) is a communicable infectious disease caused by *Mycobacterium tuberculosis* and continues to pose a significant global public health challenge. It is transmitted via airborne droplets and primarily affects the lungs, although extrapulmonary involvement may also occur¹. Pulmonary tuberculosis is characterized by key clinical symptoms such as chronic cough, weight loss, fever, and night sweats, all of which may significantly impair patients' quality of life².

From an epidemiological perspective, the World Health Organization (WHO) reports that tuberculosis remains one of the leading causes of mortality due to infectious diseases globally. In 2022, an estimated 10.6 million cases of TB were reported, resulting in more than 1.3 million deaths³. Indonesia is among the countries with the highest tuberculosis burden globally, with hundreds of thousands of new cases reported annually. This high incidence underscores that pulmonary tuberculosis remains a major challenge for healthcare systems, particularly in developing countries⁴.

Beyond its physical impact, patients with pulmonary tuberculosis frequently present with comorbid conditions that may influence clinical status and therapeutic outcomes. One comorbidity that has recently attracted increasing attention is Obstructive Sleep Apnea (OSA), a sleep-related breathing disorder characterized by recurrent upper airway obstruction, resulting in intermittent hypoxia and sleep fragmentation⁵. In patients with pulmonary tuberculosis, this condition may be precipitated by airway inflammation, impaired pulmonary function, and malnutrition, which frequently accompanies the disease⁶.

Conversely, psychological disorders such as anxiety are frequently observed in patients with pulmonary tuberculosis. Anxiety is an emotional response to stress, characterized by excessive worry, tension, and various somatic symptoms⁷. Factors including social stigma, fear of disease transmission, and the prolonged duration of treatment contribute to the high prevalence of anxiety among patients with tuberculosis. Several studies have reported that anxiety disorders may negatively impact treatment adherence and increase the risk of therapeutic failure⁸.

The association between Obstructive Sleep Apnea (OSA) and anxiety in patients with pulmonary tuberculosis has become an important concern, as these conditions may mutually exacerbate one another. OSA may result in chronic sleep disturbances that impair neuropsychological function, whereas anxiety may further deteriorate sleep quality and exacerbate OSA symptoms⁹. Nevertheless, research investigating the association between these two conditions in patients with pulmonary tuberculosis remains limited, particularly in Indonesia.

Based on this background, this study aims to analyze the risk factors of Obstructive Sleep Apnea and anxiety, as well as the association between these conditions among patients with pulmonary tuberculosis at Ibnu Sina Hospital, Makassar.

OBJECT AND METHOD

This study was an observational analytic study with a cross-sectional approach conducted at Ibnu Sina Hospital, Makassar, from February to March 2026. This design was selected to assess the relationship between risk factors and the occurrence of Obstructive Sleep Apnea (OSA) and anxiety in patients with pulmonary tuberculosis (TB) at a single point in time.

The study population consisted of all patients with pulmonary tuberculosis undergoing treatment at Ibnu Sina Hospital, Makassar, during the study period. The sample was obtained using a total sampling technique, in which all subjects meeting the inclusion and exclusion criteria were included in the study. This method was chosen to maximize the sample size and enhance population representativeness, considering the limited number of patients during the study period. A total of 85 respondents met the criteria and were included in the analysis.

Sampling was performed through a review of hospital medical records.

Data were collected through direct interviews and self-administered questionnaires. The risk of OSA was assessed using the STOP-BANG questionnaire, while anxiety levels were measured using the Generalized Anxiety Disorder-7 (GAD-7) questionnaire. In addition, demographic data such as age and sex were also collected.

This study received ethical approval from the Ethics Committee of the Faculty of Medicine, Universitas Muslim Indonesia. All respondents were provided with an explanation of the study objectives and procedures and signed informed consent prior to participation.

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 25.0. Univariate analysis was used to describe the distribution of respondent characteristics in terms of frequencies and percentages. Bivariate analysis was conducted using the Chi-square test or Fisher's exact test to assess the association between study variables. A p-value of <0.05 was prospectively set as the threshold for statistical significance.

RESULT

A total of 85 patients with pulmonary tuberculosis (TB) were included in this study. The findings are presented systematically, starting with respondent characteristics, followed by the distribution of Obstructive Sleep Apnea (OSA) and anxiety, and the associations among the study variables

Table 1. Characteristics of the Respondents

Variable	n (%) =85
Gender	
Male	44 (51.8)
Female	41 (48.2)
Age	
Adult (18-59 old)	59 (69.4)
Older Adults (>60 old)	26 (30.6)

Most respondents were male (51.8%) and were classified within the adult age group (69.4%).

Table 2. Distribution of Obstructive Sleep Apnea (OSA) Risk and Anxiety

Variable	n (%) =85
OSA Risk	
Low Risk	29 (34.1)
Moderat Risk	37 (43.5)
High Risk	19 (22.4)
Anxiety Level	
No Anxiety	76 (89.4)
Mild Anxiety	8 (9.4)
Severe Anxiety	1 (1.2)

The majority of respondents were classified as having moderate risk of OSA (43.5%), while most were categorized as having no anxiety (89.4%), suggesting that the overall level of anxiety among patients with pulmonary tuberculosis in this study was relatively low.

Table 3. Association Between Risk Factors and Obstructive Sleep Apnea (OSA)

Variable	OSA (n(%))		p-value (Conclusion)
	Low Risk	High Risk	
Gender			
Male	11 (25.0)	33 (75.0)	0.000
Female	41 (100.0)	0 (0.0)	(significant)
Age			
Adult	41 (69.8)	18 (30.5)	0.018
Older	11 (42.3)	15 (57.7)	(Not
Adults			significant)

In the adult group, the majority of respondents had a low risk of OSA, with 41 individuals (69.8%). Meanwhile, in the elderly group, 15 respondents (57.7%) were classified as having a high risk of OSA. The Chi-square test showed a p-value of 0.018 ($p < 0.05$), indicating a statistically significant association between age and OSA risk in patients with pulmonary tuberculosis.

Table 4. Association Between Risk Factors and Anxiety Levels

Variable	Anxiety Level (n(%))		p-value (Conclusion)
	No Anxiety	Anxiety	
Gender			
Male	43 (97.7)	1 (2.3)	1.000
Female	41 (100.0)	0 (0.0)	(Not
			significant)
Age			
Adult	59 (100.0)	0 (0.0)	0.306
Older	25 (96.2)	1 (3.8)	(Not
Adults			significant)

In the adult group, all respondents did not experience anxiety, totaling 59 individuals (100.0%), with no adult respondents classified as having anxiety. In contrast, in the elderly group, the majority did not experience anxiety (25 individuals; 96.2%), while only 1 respondent (3.8%) was classified as having anxiety. Fisher's Exact Test showed a p-value of 0.306 ($p > 0.05$). Therefore, it can be concluded that there was no statistically significant association between age and the occurrence of anxiety among patients with pulmonary tuberculosis in this study.

Table 5. Association Between Obstructive Sleep Apnea (OSA) and Anxiety

OSA	Anxiety Level (n(%))		p-value (Conclusion)
	No Anxiety	Anxiety	
Low Risk	52 (100.0)	0 (0.0)	0.388
High Risk	32 (97.0)	1 (3.0)	(Not
			Significant)

In the low-risk OSA group, all respondents did not experience anxiety. In contrast, in the high-risk OSA group, 32 individuals (97.0%) did not experience anxiety, while only 1 individual (3.0%) was classified as having anxiety. Statistical analysis using Fisher's Exact Test yielded a p-

value of 0.338 ($p > 0.05$), indicating that there was no statistically significant association between OSA and anxiety among patients with pulmonary tuberculosis in this study.

DISCUSSION

This study aimed to analyze the risk factors of Obstructive Sleep Apnea (OSA) and anxiety, as well as the association between these conditions in patients with pulmonary tuberculosis (TB). The findings demonstrated a significant association between age and sex with OSA occurrence. However, no significant associations were observed between age and sex with anxiety, and no statistically significant relationship was found between OSA and anxiety among patients with pulmonary tuberculosis.

Respondent characteristics indicated that most patients were male and classified within the adult age group. These findings are in line with previous studies by Lestari et al. and Jumaide, which reported a predominance of males among patients with pulmonary tuberculosis^{10,11}. This pattern is consistent with global epidemiological evidence indicating that males have a higher incidence of tuberculosis, which is influenced by behavioral factors such as smoking, occupational exposures, and delays in seeking healthcare¹². Furthermore, the predominance of adults aligns with previous studies suggesting that individuals in the productive age group are at a higher risk of tuberculosis exposure due to increased mobility and social interactions¹³.

Most respondents in this study were classified as having a moderate risk of OSA (43.5%), indicating a potential for sleep-related breathing disturbances among patients with pulmonary tuberculosis. These findings are consistent with the study by Slowik et al. (2025), which reported that screening instruments such as the STOP-Bang questionnaire are effective in identifying individuals at risk for OSA prior to diagnostic confirmation using polysomnography as the gold standard¹⁴.

Further analysis demonstrated a significant association between age and the occurrence of OSA, with older individuals exhibiting a higher risk. This is consistent with the pathophysiological mechanisms of OSA, whereby advancing age is associated with decreased upper airway muscle tone and anatomical alterations. Nevertheless, OSA may also occur in younger populations, as reported by Maulida, who identified the presence of OSA risk among individuals aged <35 years¹⁵. Furthermore, a significant association between sex and OSA was identified, with males exhibiting a higher risk, which may be attributed to behavioral factors and environmental exposures⁹.

In contrast to the OSA findings, this study demonstrated that the majority of respondents did not exhibit anxiety based on GAD-7 assessment. This suggests that not all patients with pulmonary tuberculosis experience clinically significant psychological disorders. However, these findings differ from those reported by Irawan, who found a relatively high prevalence of severe anxiety among TB patients, influenced by factors such as physical symptoms, social stigma, adverse effects of treatment, and uncertainty of prognosis¹⁶.

No significant associations were observed between age and sex with anxiety in this study. However, several studies have indicated that older individuals may be more vulnerable to anxiety due to chronic health conditions and social changes^{17,18}. Furthermore, Ahmed et al. demonstrated that females tend to have a higher prevalence of anxiety than males, although this finding may be influenced by cultural factors and variations in measurement methods¹⁹.

The principal finding of this study was the lack of a statistically significant association between OSA and anxiety. Theoretically, OSA may contribute to the development of anxiety through mechanisms including intermittent hypoxia, activation of the sympathetic nervous system, and dysregulation of neurotransmitters such as serotonin and norepinephrine²⁰. However, the lack of a significant association in this study may be explained by several factors, including the predominance of mild-to-moderate OSA, the relatively small sample size, and the presence of protective factors such as family support, adaptive coping mechanisms, and adherence to TB therapy. In addition, Xiangmin reported that psychological disturbances in patients with tuberculosis are multifactorial, where sleep disorders may function as mediating factors but are not necessarily directly associated²¹.

In summary, the results of this study suggest that the risk factors for OSA are primarily influenced by demographic characteristics, whereas anxiety did not demonstrate a significant association with the variables investigated. These findings underscore the importance of conducting comprehensive assessments in patients with pulmonary tuberculosis, incorporating physical, sleep-related, and psychological aspects, both independently and concurrently.

This study has several limitations, including its cross-sectional design, which precludes causal inference, the use of self-reported questionnaires that may introduce subjectivity, and the relatively small sample size with data derived from a single-center setting. Consequently, further research employing longitudinal designs and more objective diagnostic approaches is warranted to yield more robust and generalizable findings.

CONCLUSION

This study demonstrated significant associations between age and sex with the occurrence of Obstructive Sleep Apnea (OSA), whereas no significant associations were observed between age and sex with the occurrence of anxiety among patients with pulmonary tuberculosis (TB). In addition, no statistically significant relationship was found between OSA and anxiety, suggesting the absence of a statistical association between sleep disorders and psychological conditions in TB patients.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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ETHICAL APPROVAL

All participants were provided with a full explanation of the study objectives and procedures. Participation was voluntary, and data confidentiality was maintained. This study adhered to the ethical principles of health research and was approved by the Ethics Committee of the Faculty of Medicine, Universitas Muslim Indonesia.

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