Anxiety and Adherence to Anti-Tuberculosis Treatment Among Tuberculosis Patients in Indonesia

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Abstract

Background: Tuberculosis (TB) is a major global public health problem requiring long-term adherence to anti-tuberculosis drug therapy to achieve treatment success and prevent drug resistance. Psychological factors, particularly anxiety, may negatively influence medication adherence and compromise TB treatment outcomes. This study aimed to determine the association between anxiety levels and adherence to anti-tuberculosis treatment among tuberculosis patients undergoing therapy at health care facilities. Methods: This quantitative analytical study employed a cross-sectional design involving 47 pulmonary TB patients undergoing treatment at health care facilities. Anxiety was measured using the Hamilton Anxiety Rating Scale (HARS), while medication adherence was assessed using a structured adherence questionnaire adapted from standard TB adherence indicators. Instrument validity was assessed through expert review, and reliability testing yielded a Cronbach's alpha > 0.70. Data were analyzed using univariate analysis and the Chi-square test, with significance set at $p < 0.05$. Results: Most respondents demonstrated high adherence (61.7%), while 38.3% showed moderate adherence. The majority of patients were not anxious (66.0%), while 34.0% experienced mild anxiety. A statistically significant association was found between anxiety and medication adherence ($p = 0.006$), where patients with anxiety were more likely to have lower adherence (OR > 1). Conclusion: Anxiety is significantly associated with medication adherence among TB patients. Integrating mental health screening, patient education, and family support into TB programs is essential to improve adherence and treatment outcomes.

Keywords: Anxiety, Anti-Tuberculosis Treatment, Medication Adherence

INTRODUCTION

Tuberculosis (TB) is an infectious disease that most often attacks the lungs and is caused by certain bacteria. Transmission of this disease occurs through the air, especially when people cough, sneeze, or spit. The condition shows that tuberculosis is still a serious global health problem. In 2023, TB was recorded as one of the highest causes of death in the world after COVID-19 [1]. In 2022, around 7.5 million people in the world were diagnosed with tuberculosis and caused approximately 1.30 million deaths globally. The 30 countries with the highest TB burden account for about 87% of the total global cases, with the eight largest contributors being India (27%), Indonesia (10%), China (7.1%), the Philippines (7.0%), Pakistan (5.7%), Nigeria (4.5%), Bangladesh (3.6%), and the Democratic Republic of Congo (3.0%) [2].

Based on the Global Tuberculosis Report 2023, Indonesia ranks second as the country with the highest number of tuberculosis cases in the world, with around 1,060,000 TB cases and 134,000 TB deaths every year. It is estimated that around 17 people die from tuberculosis every hour in Indonesia. The number of TB cases was recorded at 819,000 cases in 2020 and increased to 969,000 cases in 2021. The death rate due to TB is estimated to reach 144,000 cases or equivalent to 52 deaths per 100,000 population [3].

Tuberculosis not only has an impact on physical conditions, but also provides a significant psychological burden for sufferers. The long treatment process, side effects of medication, and the social stigma that is still attached to this disease often trigger feelings of fear, anxiety, and uncertainty about recovery. This condition can reduce the patient's motivation to undergo therapy regularly and continuously [4]. Therefore, this study aimed to determine the association between anxiety levels and adherence to anti-tuberculosis treatment among tuberculosis patients undergoing therapy at health care facilities.

METHODS

This study used a quantitative analytical design with a cross-sectional approach. The study population consisted of pulmonary TB patients undergoing treatment at primary health care facilities. Total sampling was applied, resulting in 47 respondents. Inclusion criteria were patients aged ≥18 years, currently receiving anti-tuberculosis drugs (OAT), and willing to participate.

Anxiety refers to the psychological condition characterized by feelings of worry, tension, nervousness, and physiological symptoms experienced by pulmonary tuberculosis patients during treatment. In this study, anxiety was measured using the Hamilton Anxiety Rating Scale (HARS) through structured interviews. The total HARS score was categorized into two levels: 'Non-anxious'**:** respondents whose HARS score fell within the normal range; 'Mild anxiety'**:** respondents whose HARS score indicated mild anxiety. This variable was treated as a categorical variable. Medication adherence refers to the extent to which pulmonary tuberculosis patients follow the prescribed anti-tuberculosis drug (OAT) regimen in terms of dose and frequency during the treatment period. Adherence was assessed using a TB medication adherence questionnaire adapted from the national tuberculosis program indicators. Respondents were classified based on the frequency of missed doses into: 'High adherence'**:** respondents who rarely or never missed their prescribed doses. 'Moderate adherence'**:** respondents who missed doses occasionally during the treatment period This variable was analyzed as a categorical variable. The instruments underwent content validity testing by public health and nursing experts. Reliability testing showed acceptable internal consistency (Cronbach's alpha > 0.70).

Data Collection: Data were collected through structured interviews conducted by trained researchers. Data Analysis: Univariate analysis described respondent characteristics. Bivariate analysis using the Chi-square test examined the association between anxiety and adherence. Odds Ratio (OR) was calculated to estimate effect size.

Ethical approval was obtained from the Health Research Ethics Committee, Sam Ratulangi University**.** Written informed consent was obtained from all participants. Confidentiality and anonymity were strictly maintained.

RESULTS

Table 1. Distribution of Research Respondent Characteristics

Characteristic	Frequency (n)	Percentage (%)
Gender		
Man	18	38.3
Woman	29	61.7
Total	47	100
Age		
Late Teens (17-25 years old)	17	36.6
Early Adult (26-35 years)	7	14.9
Late Adult (36-45 years)	7	14.9
Early Elderly (46-55 years old)	9	19.1
Late Elderly (56-65 years old)	7	14.9
Total	47	100
Final Education		
SD	12	25.5
JUNIOR	6	12.8
Characteristic	**Frequency (n)**	**Percentage (%)**
SMA	21	44.7
College	8	17.0
Total	47	100
Work		
Self employed	9	19.1
Laborer	6	12.8
IRT	17	36.2
Employee	6	12.8
Teacher	2	4.3
Student	7	14.9
Total	47	100
How Long To Eat Oats		
≤2 Months	17	36.2
>2 Months	30	63.8
Total	47	100

Table 1 shows that most respondents were female (61.7%) and aged 17–25 years (36.6%). The majority had completed senior high school education (44.7%) and had been taking OAT for more than two months (63.8%).

Table 2. Distribution of Medication Compliance Frequency

Adherence	Frequency (n)	Percentage (%)
High	29	**61,7**
Moderate	18	**38,3**
Total	47	**100**

Table 2 shows that most of the 29 patients (61.7%) had high adherence to anti-tuberculosis medications, which indicates that the majority of patients have followed the treatment recommendations well. However, there were 18 patients (38.3%) who had moderate adherence, even though patients undergoing treatment had indications of non-compliance in taking medication, either because patients sometimes forgot to take medication, deliberately reduced the dose of medication taken due to perceived side effects, and felt disturbed to take medication every day.

Table 3. Distribution of Anxiety Frequency in Pulmonary TB Patients

Anxiety	Frequency (n)	Percentage (%)
Not anxious	31	**66,0**
Mild Anxiety	16	**34,0**
Total	47	**100**

Table 3 shows that the majority of patients, namely 31 patients (66.0%) did not experience anxiety in undergoing treatment. This shows that most patients have a stable psychological condition and are able to accept the treatment process of Pulmonary TB well. However, there were 16 patients (34.0%) who experienced mild anxiety. Even though it is relatively mild, anxiety can still affect patients' adherence to treatment.

Table 4. Analysis of the Relationship between Anxiety and Compliance with Anti-Tuberculosis Medication

Anxiety	Adherence				Total		p-value
	High		Moderate				
	n	%	n	%	n	%	
Not anxious	24	77,4	7	22,6	31	100	
Mild Anxiety	5	31,3	11	68,8	16	100	**0,006**
Total	29	61,7	18	38,3	47	100	

Table 4 shows the results of 31 patients who did not experience anxiety as many as 24 patients (77.4%) showed high adherence, but 7 patients (22.6%) who despite not experiencing anxiety were at a moderate level of adherence. Meanwhile, of the 16 patients with mild anxiety, 11 patients (68.8%) were found to have moderate adherence, although there were 5 patients (31.3%) who showed high adherence.

The results of *the Chi Square* test obtained a *p-value* of 0.006 ($p < 0.05$) which means that anxiety is signinicantly related to adherence to taking Anti-Tuberculosis Drugs (OAT). So it can be concluded that there is a relationship between anxiety and adherence to taking anti-tuberculosis drugs in pulmonary TB patients.

DISCUSSIONS

This study demonstrates a significant relationship between anxiety levels and adherence to taking anti-tuberculosis (anti-TB) drugs among TB patients, where patients with higher anxiety levels tend to show lower adherence. This finding directly reflects the study results and confirms that psychological factors are closely linked to treatment behavior in TB patients. Similar associations have been reported in international studies, indicating that mental health conditions play a crucial role in adherence to long-term therapy in chronic diseases, including tuberculosis [5,6].

From a theoretical perspective, anxiety may interfere with patients' ability to maintain consistent treatment behavior. Anxiety in TB patients is often influenced by prolonged treatment duration, uncertainty about disease outcomes, and concerns related to social stigma. Psychological distress has been shown to impair emotional stability and cognitive function, thereby reducing concentration, decision-making capacity, and the ability to follow treatment regimens consistently [7,8]. The findings of this study support previous evidence that mental health problems in TB patients remain underrecognized and inadequately managed in routine care settings [9].

Physiologically and psychologically, anxiety can manifest as sleep disturbances, reduced attention, and decreased self-efficacy, all of which may contribute to missed doses and reduced motivation to complete treatment. Anxiety is also associated with avoidance behaviors, including intentional interruption of therapy due to fear of medication side effects [10,11]. In this study, although most respondents were classified as non-anxious, a considerable proportion (34%) still experienced mild anxiety, which was sufficient to influence adherence behavior. This suggests that even low to moderate levels of anxiety can have meaningful clinical implications for TB treatment adherence.

The relatively high proportion of non-anxious patients observed in this study may be explained by contextual factors such as the duration of treatment and patient adaptation over time. Many respondents were in the continuation phase of therapy, which may reduce uncertainty and emotional distress compared to the early phase of treatment. Additionally, educational background and access to health services may have contributed to better psychological adjustment. Nevertheless, the presence of mild anxiety in more than one-third of patients indicates that psychological vulnerability remains an important concern.

Social and environmental factors also appear to interact with anxiety and adherence. Family support plays a significant role in buffering the negative effects of anxiety on medication adherence. Patients who receive emotional and instrumental support from their families tend to demonstrate better adherence, while lack of support is associated with higher anxiety levels and increased risk of treatment interruption [17,18]. These findings are consistent with the biopsychosocial model, which emphasizes that health outcomes are shaped by the interaction of biological, psychological, and social factors [7,5].

The role of health workers is therefore critical in identifying anxiety early and addressing it appropriately. Routine mental health screening among TB patients can facilitate early detection of anxiety disorders and enable timely psychosocial interventions. International guidelines have increasingly emphasized the integration of mental health services into TB programs as part of comprehensive patient-centered care [19,20]. Counseling interventions, stress education, and behavior-modification approaches have been shown to reduce anxiety and improve medication adherence by strengthening patients' coping mechanisms during prolonged treatment [9,20].

If anxiety is not adequately addressed, its consequences may extend beyond individual patients to broader public health outcomes. Poor adherence increases the risk of treatment failure, disease recurrence, and the development of multidrug-resistant tuberculosis (MDR-TB), which poses a serious threat to TB control efforts globally [21,22]. The findings of this study therefore highlight the importance of addressing anxiety not only as a mental health issue but also as a determinant of TB treatment success.

Several limitations should be considered when interpreting these findings. The cross-sectional design does not allow causal inference between anxiety and adherence. Additionally, reliance on self-reported questionnaires may introduce recall and social desirability bias [10,12]. Potential confounding factors such as education level, duration of treatment, and family support were not fully controlled and may have influenced both anxiety levels and adherence behavior.

Future research is recommended to use longitudinal designs to better clarify causal pathways between anxiety and medication adherence. Qualitative studies may also provide deeper insight into patients' subjective experiences of anxiety and coping during long-term TB treatment [8,18]. Overall, the findings of this study reinforce the importance of mental health, particularly anxiety, as a key component of TB treatment success. Integrating mental health services, strengthening communication between patients and health workers, and enhancing family support remain essential strategies to improve medication adherence and treatment outcomes [5,9].

CONCLUSIONS

There is a statistically significant relationship between anxiety and adherence to anti-tuberculosis drug therapy among TB patients. Patients with higher anxiety levels are more likely to demonstrate lower adherence, potentially compromising treatment success. Integrating mental health interventions, patient education, and family support into TB control programs is essential to improve adherence and achieve optimal treatment outcomes.

Declaration of Conflicting Interest

The author (s) declared no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

[1]   World Health Organization, "Tuberculosis," *World Health Organization*, 2024.
[2]   World Health Organization, *Global Tuberculosis Report 2023*. 2023.
[3]   D. J. P. and P. Ministry of Health Indonesia, "Report on the 2022 Tuberculosis Control Program," *Ministry of Health of the Republic of Indonesia*, p. 156, 2023.
[4]   B. A. Wijaya, J. Prasetyo, and S. R. P. Santoso, "The Relationship between Anxiety and Depression Levels in the Treatment of Tuberculosis (TB)," *J. EDUNursing*, vol. 5, no. 1, pp. 10–22, 2021.
[5]   World Health Organization, *Global Tuberculosis Report 2023*. Geneva, Switzerland: WHO, 2023.
[6]   A. Pachi, D. Bratis, G. Moussas, and A. Tselebis, "Psychiatric morbidity and other factors affecting treatment adherence in pulmonary tuberculosis patients," *Tuberculosis Research and Treatment*, vol. 2013, pp. 1–7, 2013.

[7] M. E. Kemeny et al., "Psychological stress and disease progression," *American Psychologist*, vol. 72, no. 2, pp. 135–150, 2017.

[8] B. Duko, A. Bedaso, and G. Ayano, "Depression among patients with tuberculosis," *Neuropsychiatric Disease and Treatment*, vol. 11, pp. 129–135, 2015.

[9] A. C. Sweetland et al., "Addressing mental health needs in TB control," *International Journal of Tuberculosis and Lung Disease*, vol. 18, no. 12, pp. 1511–1517, 2014.

[10] M. R. DiMatteo, H. S. Lepper, and T. W. Croghan, "Depression and adherence to medical treatment," *Medical Care*, vol. 40, no. 9, pp. 794–811, 2012.

[11] P. Mishra, E. H. Hansen, and S. Sabroe, "Adherence to tuberculosis treatment: A systematic review," *BMC Public Health*, vol. 6, p. 42, 2016.

[12] R. Courtney et al., "Tuberculosis stigma and its impact on medication adherence," *Social Science & Medicine*, vol. 222, pp. 212–220, 2019.

[13] P. Naidoo et al., "Barriers and facilitators to tuberculosis treatment adherence," *BMC Public Health*, vol. 15, p. 394, 2015.

[14] H. H. Tola et al., "Psychological distress and tuberculosis treatment outcomes in Ethiopia," *PLoS ONE*, vol. 11, no. 2, e0147621, 2016.

[15] G. Tesfahuneygn, G. Medhin, and M. Legesse, "Adherence to anti-tuberculosis treatment and associated factors," *Ethiopian Journal of Health Sciences*, vol. 29, no. 1, pp. 1–8, 2019.

[16] K. Peltzer, "Psychological distress and tuberculosis treatment outcomes," *Public Health Action*, vol. 4, no. 1, pp. 10–14, 2014.

[17] J. Xu et al., "Family support and medication adherence in tuberculosis patients," *Patient Preference and Adherence*, vol. 14, pp. 127–135, 2020.

[18] S. Chaudhri et al., "Social support and adherence in chronic disease management," *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, vol. 23, p. 100234, 2021.

[19] World Health Organization, *Guidelines for Mental Health and Primary Care*. Geneva, Switzerland: WHO, 2022.

[20] S. Kanters et al., "Patient-centered interventions to improve tuberculosis adherence," *The Lancet Global Health*, vol. 5, no. 4, pp. e369–e370, 2017.

[21] Centers for Disease Control and Prevention, *Drug-Resistant Tuberculosis Guidelines*. Atlanta, GA, USA: CDC, 2022.

[22] C. Lange et al., "Management of drug-resistant tuberculosis," *European Respiratory Journal*, vol. 54, no. 3, p. 1900347, 2019.