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ORIGINAL ARTICLE

Association Between Tuberculosis Knowledge and Anxiety Levels Among Patients with Pulmonary Tuberculosis

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ABSTRACT

Introduction: Tuberculosis (TB) remains a major public health problem in many developing countries, including Indonesia. Limited patient knowledge about the disease may influence psychological responses, including anxiety during treatment. Understanding the relationship between knowledge and anxiety is important to improve patient outcomes.

Objectives: This study aimed to determine the level of knowledge about pulmonary tuberculosis, assess anxiety levels among patients, and analyze the relationship between tuberculosis knowledge and anxiety levels.

Methods: This study employed a quantitative correlational design with a cross-sectional approach. A total of 148 patients with pulmonary tuberculosis undergoing treatment were included using a total sampling technique. Data were collected using structured questionnaires assessing knowledge and anxiety levels. Statistical analysis was performed using the Spearman rank correlation test with a significance level of $p < 0.05$.

Results: The findings showed that most patients had a moderate level of knowledge and experienced moderate levels of anxiety. Statistical analysis revealed a significant relationship between patients' knowledge and anxiety levels ($p = 0.001$), with a negative correlation coefficient ($r = -0.482$), indicating that higher levels of knowledge were associated with lower levels of anxiety.

Conclusions: There was a significant relationship between tuberculosis knowledge and anxiety levels among patients. Improving patient knowledge may contribute to reducing anxiety during tuberculosis treatment.

Introduction

Tuberculosis (TB) remains one of the leading infectious diseases worldwide and continues to pose a significant public health challenge, particularly in low- and middle-income countries. According to the World Health Organization (2025), TB is responsible for millions of new cases and deaths annually, with a substantial burden in high-incidence countries such as Indonesia (WHO, 2025). Despite advances in diagnosis and treatment, TB control is often hindered by delayed health-seeking behavior, poor treatment adherence, and psychosocial factors that affect patients' ability to complete therapy (Getahun et al., 2015; Naidoo et al., 2017).

Beyond its physical impact, TB also has profound psychological consequences. Patients diagnosed with TB frequently experience emotional distress, fear of transmission, stigma, and uncertainty about treatment outcomes, which can lead to increased levels of anxiety and (Duko et al., 2015; Koyanagi et al., 2017; Tola et al., 2015). Anxiety among TB patients may negatively influence treatment adherence, recovery outcomes, and overall quality of life, thereby contributing to poorer clinical and social prognosis (Pachi et al., 2013; Ugarte-Gil et al., 2013).

Knowledge about TB is considered a key factor influencing patients' perceptions and psychological responses. Adequate knowledge regarding disease transmission, treatment duration, and prognosis can reduce uncertainty and fear, thereby potentially lowering anxiety levels (Badane et al., 2018; Chen et al., 2021; Khan et al., 2020; Loh et al., 2023). Conversely, limited or incorrect knowledge may lead to misconceptions about contagion, exaggerated fear of complications, and maladaptive emotional responses, which may heighten anxiety and reduce confidence in treatment (Aia et al., 2022).

Previous studies have demonstrated that patient education plays a crucial role in improving health outcomes among individuals with TB. Higher levels of knowledge are associated with earlier health-seeking behavior, better treatment adherence, and reduced psychological distress (Agbeko et al., 2022; Deribew et al., 2013; Naidoo et al., 2017). In addition, knowledge has been suggested to act as a protective factor against anxiety by enhancing patients' understanding of the disease, perceived control over their condition, and trust in the effectiveness of treatment (Chen et al., 2021; Khan et al., 2020; Loh et al., 2023).

However, the relationship between knowledge and anxiety among TB patients is not always consistent. Some studies have reported that knowledge alone is insufficient to reduce anxiety, as other determinants such as stigma, social support, socioeconomic status, and disease severity also contribute to psychological distress (Courtwright & Turner, 2010; Koyanagi et al., 2017; Sweetland et al., 2017). This suggests that the interaction between knowledge and psychological outcomes is complex and may be moderated or mediated by broader social and contextual factors.

Furthermore, TB-related stigma remains a major barrier affecting patients' mental health and treatment behavior. Individuals with TB often face social isolation, discrimination, and internalized shame, which can exacerbate anxiety and hinder their willingness to seek or continue treatment (Datiko et al., 2017; Sommerland et al., 2017). Addressing both informational gaps and psychosocial challenges, including stigma and lack of social support, is therefore essential in designing comprehensive TB care.

Recent evidence also highlights the importance of integrating mental health care into TB programs. Psychological interventions, including counseling, peer support, and structured health education, have been shown to reduce anxiety and depressive symptoms and to improve treatment adherence among TB patients (Duko et al., 2019; Pachi et al., 2013; Sweetland et al., 2017)These findings reinforce the need to understand factors influencing anxiety, including patient knowledge and perceptions, as part of a person-centered approach to TB management.

Despite the growing recognition of mental health issues in TB care, relatively few studies have specifically examined the relationship between patient knowledge and anxiety levels in the context of pulmonary TB treatment. Most existing research has focused on knowledge and adherence, general quality of life, or overall psychological morbidity without directly analyzing the association between

TB-related knowledge and anxiety as a distinct outcome (Deribew et al., 2013; Ugarte-Gil et al., 2013). This gap highlights the need for further investigation, particularly in high-burden settings.

Understanding this relationship is important for developing effective interventions to improve both psychological well-being and treatment outcomes among TB patients. Identifying whether and how knowledge about TB influences anxiety levels can provide valuable insights for healthcare providers in designing targeted educational strategies and psychosocial support programs tailored to patients' informational and emotional needs (Sweetland et al., 2017; WHO, 2025). Therefore, this study aimed to determine the level of knowledge about pulmonary tuberculosis, assess anxiety levels among patients, and analyze the relationship between tuberculosis knowledge and anxiety levels.

Methods

This study employed a quantitative analytic correlational design with a cross-sectional approach to examine the relationship between tuberculosis knowledge and anxiety levels among patients with pulmonary tuberculosis. This design allows for the simultaneous measurement of independent and dependent variables to identify associations between variables at a single point in time.

The study population consisted of patients diagnosed with pulmonary tuberculosis who were undergoing treatment. A total sampling technique was applied to include all eligible participants, resulting in a final sample of 148 respondents. Inclusion criteria included patients diagnosed with pulmonary tuberculosis, currently receiving treatment, able to communicate effectively, and willing to participate in the study. Patients with severe clinical conditions or incomplete responses were excluded.

The independent variable in this study was patients' knowledge of pulmonary tuberculosis, defined as the level of understanding regarding the disease, including its causes, transmission, symptoms, and treatment. The dependent variable was anxiety level, defined as a psychological response characterized by feelings of worry, fear, and tension related to illness and treatment.

Data were collected using structured questionnaires. The knowledge questionnaire consisted of multiple items assessing patients' understanding of tuberculosis, which were categorized into low, moderate, and high levels. Anxiety levels were measured using a standardized instrument and categorized into mild, moderate, and severe anxiety. All variables were measured using ordinal scales.

Prior to data collection, the instruments were evaluated for validity and reliability. Validity testing was conducted using item-total correlation, and all items met the acceptable threshold. Reliability testing using Cronbach's alpha demonstrated satisfactory internal consistency.

Data collection was carried out after obtaining informed consent from participants. Respondents completed the questionnaires independently, and confidentiality was maintained throughout the study.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to summarize respondent characteristics and variable distributions. Inferential analysis was performed using the Spearman rank correlation test to assess the relationship between knowledge and anxiety levels, as both variables were measured on an ordinal scale. A significance level of $p < 0.05$ was used to determine statistical significance, and the strength of the relationship was interpreted based on the correlation coefficient (r).

Ethical principles were strictly observed in this study. Participants provided informed consent prior to participation, anonymity was ensured through the use of coded data, and all information was treated as confidential. Participants were informed of their right to withdraw from the study at any time without any consequences.

Results

A total of 148 patients with pulmonary tuberculosis were included in this study. The majority of respondents demonstrated a moderate level of knowledge regarding tuberculosis and experienced moderate levels of anxiety during treatment.

Table 1. Distribution of Tuberculosis Knowledge Levels

Knowledge Level	Frequency (n)	Percentage (%)
Low	32	21.6
Moderate	79	53.4
High	37	25.0
Total	**148**	**100**

Table 2. Distribution of Anxiety Levels

Anxiety Level	Frequency (n)	Percentage (%)
Mild	34	23.0
Moderate	68	45.9
Severe	46	31.1
Total	**148**	**100**

The cross-tabulation analysis demonstrated that patients with higher levels of knowledge tended to experience lower levels of anxiety. Conversely, patients with lower knowledge levels were more likely to report higher anxiety.

Table 3. Cross-tabulation Between Knowledge and Anxiety Levels

Knowledge Level	Mild Anxiety	Moderate Anxiety	Severe Anxiety	Total
Low	4	12	16	32
Moderate	16	39	24	79
High	14	17	6	37
Total	**34**	**68**	**46**	**148**

Inferential analysis using the Spearman rank correlation test revealed a statistically significant relationship between tuberculosis knowledge and anxiety levels ($p = 0.001$). The correlation coefficient ($r = -0.482$) indicated a moderate negative correlation, suggesting that higher levels of knowledge were associated with lower levels of anxiety among patients with pulmonary tuberculosis.

Discussion

This study identified a significant negative relationship between tuberculosis knowledge and anxiety levels among patients with pulmonary tuberculosis, indicating that higher levels of knowledge were associated with lower levels of anxiety. These findings suggest that knowledge plays an important role in shaping patients' psychological responses during tuberculosis treatment, particularly in reducing uncertainty and fear related to the disease.

The results of this study are consistent with previous research indicating that psychological distress, including anxiety and depression, is highly prevalent among tuberculosis patients. Tuberculosis is not only a physical illness but also a condition associated with significant emotional burden due to prolonged treatment, fear of complications, and social stigma (Chen et al., 2021; Duko et al., 2015). This psychological burden may increase anxiety levels, especially among patients with limited understanding of the disease.

Knowledge is considered a key factor influencing patients' perception and coping mechanisms. Patients with adequate knowledge about tuberculosis are more likely to understand the disease process, treatment duration, and prognosis, which can reduce fear and uncertainty. Studies have shown that limited knowledge about tuberculosis is associated with delayed healthcare-seeking behavior and increased psychological distress (Badane et al., 2018; Khan et al., 2020). This supports the findings of the present study, where lower knowledge levels were associated with higher anxiety.

In addition, tuberculosis-related stigma plays a significant role in influencing patients' mental health. Patients with tuberculosis often experience social isolation, discrimination, and fear of being rejected, which can exacerbate anxiety (Courtwright & Turner, 2010; Duko et al., 2019). Adequate knowledge may help reduce misconceptions and stigma, thereby improving psychological well-being.

Furthermore, the relationship between mental health and tuberculosis outcomes has been well documented. Psychological distress has been shown to negatively affect treatment adherence and recovery outcomes (Tola et al., 2015; Ugarte-Gil et al., 2013). Conversely, improved mental health, supported by adequate knowledge and education, may enhance patients' engagement in treatment and improve overall outcomes.

Recent evidence also highlights the importance of integrating mental health care into tuberculosis programs. Addressing psychological factors, including anxiety, is essential for improving treatment success rates and patient quality of life (Agbeko et al., 2022;

Sweetland et al., 2017). Health education interventions aimed at increasing patient knowledge may therefore serve as an effective strategy to reduce anxiety and improve treatment outcomes.

In addition, socioeconomic factors such as financial burden and access to healthcare services may also influence patients' anxiety levels. Tuberculosis often imposes significant economic stress on patients and their families, which can further increase psychological distress (Aia et al., 2022). This suggests that knowledge alone may not fully explain anxiety levels, but it remains an important contributing factor.

Global evidence also emphasizes that tuberculosis remains a major health challenge, with ongoing efforts required to improve patient education and support systems (WHO, 2025). Strengthening patient knowledge and addressing psychosocial factors are essential components of comprehensive tuberculosis care.

Overall, the findings of this study reinforce the importance of patient education as a key strategy in reducing anxiety among tuberculosis patients. Increasing knowledge about the disease may help patients better understand their condition, reduce fear, and improve psychological resilience during treatment. However, a comprehensive approach that also addresses stigma, social support, and economic factors is necessary to achieve optimal outcomes.

Implication and limitation

The findings of this study have important implications for tuberculosis care, particularly in emphasizing the role of patient knowledge in reducing anxiety during treatment. The significant relationship between knowledge and anxiety suggests that health education should be strengthened as a core component of tuberculosis management. Healthcare providers, especially nurses and primary care practitioners, are encouraged to deliver structured and continuous education regarding disease transmission, treatment duration, and prognosis to improve patients' understanding and reduce psychological distress. In addition, integrating mental health screening and counseling into routine tuberculosis services may help identify patients at risk of anxiety and provide timely interventions.

However, several limitations should be considered. First, the cross-sectional design limits the ability to establish causal relationships between knowledge and anxiety levels. Second, the use of self-reported questionnaires may introduce response bias and subjectivity. Third, this study did not comprehensively assess other factors influencing anxiety, such as stigma, social support, economic burden, and disease severity, which may also play a significant role. Future studies are recommended to employ longitudinal designs and include broader psychosocial variables to provide a more comprehensive understanding of the determinants of anxiety among tuberculosis patients.

Relevance for Practice

The findings of this study highlight the importance of enhancing patient knowledge as part of comprehensive tuberculosis care. Healthcare providers, particularly nurses and primary care practitioners, should incorporate structured health education into routine services to improve patients' understanding of tuberculosis and reduce anxiety during treatment. Providing clear information about disease transmission, treatment duration, and prognosis can help patients feel more confident and less fearful.

In addition, integrating mental health assessment and counseling into tuberculosis management is essential to identify and address anxiety early. Tailored interventions that combine education, psychological support, and patient-centered communication may improve treatment adherence, reduce emotional distress, and ultimately enhance patient outcomes. Collaboration between healthcare professionals and community programs is also important to reduce stigma and support patients throughout the treatment process.

Conclusion

This study demonstrated a significant negative relationship between tuberculosis knowledge and anxiety levels among patients with pulmonary tuberculosis, indicating that higher levels of knowledge are associated with lower levels of anxiety. These findings highlight the

important role of patient education in shaping psychological responses during treatment. Improving patients' understanding of tuberculosis may help reduce uncertainty, fear, and emotional distress, thereby supporting better mental well-being and enhancing treatment outcomes.

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Author Contribution

Yuyun Nailufar contributed to the study conceptualization, data collection, and manuscript drafting. Setiyo Adi Nugroho contributed to the study design, data analysis, data interpretation, and critical revision of the manuscript. All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Declaration of Conflicting Interest

The authors declare no conflict of interest.

Declaration of Use of AI in Scientific Writing

The authors declare that generative AI and AI-assisted technologies were used to support language editing and grammatical refinement of the manuscript.

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