
RELATIONSHIP BETWEEN KNOWLEDGE AND ATTITUDES AND TUBERCULOSIS PREVENTION AMONG PULMONARY TUBERCULOSIS PATIENTS

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Abstract: *Background: Tuberculosis (TB) remains a major public health problem worldwide and continues to contribute significantly to morbidity and mortality, particularly in developing countries. Patients' knowledge and attitudes play an important role in influencing preventive behaviors and reducing disease transmission. This study aimed to determine the relationship between knowledge and attitudes of pulmonary tuberculosis patients and their tuberculosis prevention efforts in the working area of Singkawang Utara 1 Public Health Center. Methods: This quantitative study employed an analytical cross-sectional design. The study population consisted of all registered pulmonary tuberculosis patients in the working area of Singkawang Utara 1 Public Health Center. A total sampling technique was used, involving 32 respondents. Data were collected using structured questionnaires assessing knowledge, attitudes, and tuberculosis prevention practices. Statistical analysis was conducted using the Chi-square test with a significance level of 0.05. Results: Most respondents had poor knowledge (56.3%), negative attitudes (75.0%), and inadequate tuberculosis prevention practices (53.1%). Statistical analysis revealed a significant relationship between knowledge and tuberculosis prevention efforts ($p = 0.000$). In addition, a significant relationship was found between attitudes and tuberculosis prevention efforts ($p = 0.028$). Conclusion: Knowledge and attitudes are significantly associated with tuberculosis prevention efforts among pulmonary tuberculosis patients. Improving patient education and promoting positive attitudes toward disease prevention may enhance preventive behaviors and contribute to reducing tuberculosis transmission in the community.*

INTRODUCTION

Tuberculosis (TB) remains one of the leading infectious diseases worldwide and continues to pose a major public health challenge, particularly in low- and middle-income countries. According to the World Health Organization (WHO), approximately 10.8 million people developed tuberculosis globally in 2023, making TB one of the deadliest infectious diseases worldwide despite the availability of effective prevention and treatment

strategies(WHO, 2024). The persistent burden of TB highlights the need for comprehensive approaches that integrate clinical management with behavioral and community-based interventions to reduce disease transmission and improve treatment outcomes (WHO, 2024).

Indonesia is among the countries with the highest tuberculosis burden globally(WHO, 2024). The high incidence of TB reflects ongoing challenges in disease control, including delayed diagnosis, inadequate treatment adherence, limited public awareness, and continued transmission within households and communities(Krishnamoorthy et al., 2025). Although national tuberculosis control programs have been strengthened in recent years, the disease remains a significant public health concern, requiring greater attention to preventive measures and patient engagement in disease management(Fox et al., 2021; Sulis et al., 2014).

Tuberculosis is primarily transmitted through airborne droplets released when infected individuals cough, sneeze, speak, or sing(WHO, 2026). Therefore, preventive behaviors such as proper cough etiquette, mask use, adequate ventilation, treatment adherence, and early healthcare seeking are essential to reducing transmission(Daradkeh et al., 2025). The adoption of these preventive practices is strongly influenced by an individual's knowledge and attitudes regarding the disease(Shihora et al., 2024). Knowledge provides the cognitive foundation for understanding disease transmission, symptoms, treatment, and prevention, while attitudes influence an individual's willingness to engage in recommended health behaviors(Kim et al., 2022). According to health behavior theories, individuals with adequate knowledge and positive attitudes are more likely to adopt preventive practices that reduce the risk of disease transmission and improve health outcomes(Rivera-Lozada et al., 2021).

Several studies have demonstrated that knowledge and attitudes are important determinants of tuberculosis prevention practices(Juliasih et al., 2024; Zhang et al., 2024). Research conducted in various populations found that inadequate knowledge and unfavorable attitudes were associated with poor preventive behaviors and lower adherence to tuberculosis control measures(Madebo et al., 2023). A study among household contacts of TB patients reported insufficient knowledge, unfavorable attitudes, and suboptimal prevention practices, emphasizing the need for targeted educational interventions (Agustina & Wahjuni, 2017). Similarly, recent studies have shown that improvements in knowledge and attitudes through health education programs significantly enhance preventive behaviors and treatment adherence among individuals affected by tuberculosis(Johnson et al., 2026).

Despite growing evidence regarding the role of knowledge and attitudes in tuberculosis prevention, findings may vary according to geographical, socioeconomic, educational, and cultural contexts(Guardia Zuñiga et al., 2025). Therefore, local evidence is needed to better understand the factors influencing preventive behaviors among tuberculosis patients in specific communities(Wongchana & Songthap, 2024). In Singkawang City, West Kalimantan, pulmonary tuberculosis remains an important health concern managed through primary healthcare services, including those provided by Singkawang Utara 1 Public Health Center (tambahkan referensi lokal/Dinas Kesehatan atau Profil Kesehatan daerah). However, information regarding the relationship between patients' knowledge, attitudes, and prevention efforts in this setting remains limited (perlu referensi penelitian sebelumnya atau data lokal jika tersedia).

Understanding these relationships is essential for designing effective health promotion and educational programs aimed at strengthening tuberculosis prevention practices among patients and their families (Guardia Zuñiga et al., 2025). Therefore, this study aimed to analyze the relationship between knowledge and attitudes of pulmonary tuberculosis patients and their tuberculosis prevention efforts in the working area of Singkawang Utara 1 Public Health Center. The findings are expected to contribute to the development of evidence-based interventions that improve preventive behaviors and support national tuberculosis control strategies (Daradkeh et al., 2025).

METHODS

This study employed a quantitative analytical research design using a cross-sectional approach. The study was conducted in the working area of Singkawang Utara 1 Public Health Center, Singkawang City, West Kalimantan, Indonesia, from January to March 2026. The cross-sectional design was selected to examine the relationship between patients' knowledge and attitudes toward pulmonary tuberculosis and their tuberculosis prevention efforts at a single point in time. The target population consisted of all registered pulmonary tuberculosis patients receiving treatment at Singkawang Utara 1 Public Health Center. A total sampling technique was applied, whereby all eligible patients were included in the study. The final sample comprised 32 respondents who met the inclusion criteria: (1) diagnosed with pulmonary tuberculosis and had attended at least two treatment visits, (2) aged 20 years or older, (3) residing within the working area of Singkawang Utara 1 Public Health Center, (4) willing to participate in the study, and (5) able to read and write. Patients who were severely ill or unable to complete the questionnaire were excluded from the study.

Data were collected using a structured questionnaire consisting of four sections. The first section gathered respondents' demographic characteristics, including age, sex, educational level, and occupation. The second section assessed knowledge regarding pulmonary tuberculosis, including causes, symptoms, transmission routes, treatment, and prevention measures. The third section evaluated respondents' attitudes toward tuberculosis prevention using a Likert-scale format. The fourth section measured tuberculosis prevention practices, including cough etiquette, mask use, treatment adherence, environmental sanitation, and efforts to prevent disease transmission within the household.

Prior to data collection, the questionnaire was reviewed by experts in public health and nursing to ensure content validity. A pilot test was conducted among a small group of respondents outside the study population to assess the clarity and reliability of the instrument. Necessary revisions were made based on the pilot study findings. Data collection was carried out after obtaining ethical approval and informed consent from all participants. Respondents completed the questionnaire independently under the supervision of the researchers. Confidentiality and anonymity were maintained throughout the study.

The independent variables in this study were knowledge and attitudes toward pulmonary tuberculosis, while the dependent variable was tuberculosis prevention efforts. Knowledge was categorized into good, moderate, and poor levels based on respondents' scores. Attitudes were classified as positive or negative, while prevention efforts were categorized as good, moderate, or poor. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics, including frequencies,

percentages, means, and standard deviations, were used to describe respondents' characteristics and study variables. The relationship between knowledge and tuberculosis prevention efforts, as well as between attitudes and tuberculosis prevention efforts, was analyzed using the Chi-square test. Statistical significance was determined at a p-value of less than 0.05. This study adhered to ethical principles involving human participants, including respect for autonomy, confidentiality, beneficence, and justice. Ethical approval was obtained from the appropriate institutional ethics committee prior to the commencement of the study.

RESULTS AND DISCUSSION

Respondent Characteristics

A total of 32 pulmonary tuberculosis patients participated in this study. Most respondents were aged 36–55 years (40.6%), male (59.4%), had elementary school education (46.9%), and worked in the private sector (34.4%).

The predominance of respondents in the productive age group is consistent with the epidemiological pattern of tuberculosis, which commonly affects economically active populations. Individuals within this age range generally have higher mobility and social interaction, increasing the risk of exposure to *Mycobacterium tuberculosis* (WHO, 2024). The higher proportion of male respondents is also in line with global tuberculosis reports indicating that men are more likely to develop active tuberculosis than women due to occupational exposure, smoking habits, and delayed healthcare-seeking behavior (WHO, 2024).

Knowledge, Attitudes, and Tuberculosis Prevention Efforts

The findings showed that 18 respondents (56.3%) had poor knowledge regarding tuberculosis, while only 7 respondents (21.9%) demonstrated good knowledge. Furthermore, most respondents exhibited negative attitudes toward tuberculosis prevention (75.0%). Regarding prevention practices, more than half of the respondents (53.1%) reported poor tuberculosis prevention efforts. The high proportion of poor knowledge observed in this study suggests that many patients still lack adequate understanding regarding tuberculosis transmission, symptoms, treatment, and prevention. Educational level may contribute to this finding, as nearly half of the respondents had only completed elementary school education. Previous studies have demonstrated that lower educational attainment is associated with limited health literacy and reduced access to health information (Matchanova et al., 2023).

Similarly, the predominance of negative attitudes toward tuberculosis prevention may indicate the persistence of misconceptions and stigma related to the disease. Negative attitudes can reduce motivation to adopt preventive behaviors and may interfere with treatment adherence. According to (Jia & Qi, 2024), attitudes significantly influence individual decision-making processes related to disease prevention and health-seeking behavior.

Relationship Between Knowledge and Tuberculosis Prevention Efforts

Table 1 presents the relationship between knowledge and tuberculosis prevention efforts among respondents.

Table 1. Relationship Between Knowledge and Tuberculosis Prevention Efforts

Knowledge	Good n (%)	Moderate n (%)	Poor n (%)	Total n (%)
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Good	6 (85.7)	0 (0.0)	1 (14.3)	7 (100)
Moderate	1 (14.3)	5 (71.4)	1 (14.3)	7 (100)
Poor	1 (5.6)	2 (11.1)	15 (83.3)	18 (100)

Chi-square test: p = 0.000

The statistical analysis revealed a significant relationship between knowledge and tuberculosis prevention efforts ($p < 0.05$). Respondents with good knowledge tended to demonstrate better preventive practices, whereas respondents with poor knowledge predominantly reported inadequate prevention efforts. This finding supports the concept that knowledge is a prerequisite for behavioral change. Individuals who understand how tuberculosis is transmitted and prevented are more likely to implement preventive measures, including proper cough etiquette, mask use, environmental sanitation, and adherence to treatment recommendations. According to the Health Belief Model, knowledge influences risk perception and perceived benefits, which subsequently affect health-related behaviors (Fang et al., 2025).

The results are consistent with those reported by (Ayu Andini Saleha et al., 2024), who found that household contacts with higher tuberculosis-related knowledge exhibited significantly better preventive practices. Similarly, (Pramono et al., 2018) reported that adequate tuberculosis knowledge was associated with improved prevention behaviors among health science students.

The findings suggest that educational interventions should be strengthened within tuberculosis management programs. Continuous health education delivered by healthcare workers may improve patient understanding and contribute to more effective disease prevention efforts.

Relationship Between Attitudes and Tuberculosis Prevention Efforts

Table 2 presents the relationship between attitudes and tuberculosis prevention efforts.

Table 2. Relationship Between Attitudes and Tuberculosis Prevention Efforts

Attitude	Good n (%)	Moderate n (%)	Poor n (%)	Total n (%)
Positive	4 (50.0)	3 (37.5)	1 (12.5)	8 (100)
Negative	4 (16.7)	4 (16.7)	16 (66.7)	24 (100)

Chi-square test: p = 0.028

The analysis demonstrated a statistically significant relationship between attitudes and tuberculosis prevention efforts ($p = 0.028$). Respondents with positive attitudes were more likely to perform appropriate preventive practices than those with negative attitudes. Attitudes represent an individual's evaluation of a particular behavior and are recognized as an important determinant of health behavior. Positive attitudes toward tuberculosis prevention may encourage patients to comply with treatment regimens, practice infection control measures, and actively participate in health promotion activities. Conversely, negative attitudes may reduce motivation to engage in preventive actions and contribute to continued disease transmission.

The present findings are consistent with (Zhang et al., 2024), who reported that positive attitudes significantly improved preventive behavior among individuals at risk of tuberculosis. Likewise, (Masudi et al., 2025) found that favorable attitudes were associated with better compliance with preventive recommendations and treatment protocols. The

predominance of negative attitudes in this study may be influenced by inadequate counseling, social stigma, and limited access to reliable health information. Tuberculosis-related stigma remains a major challenge in disease control because it discourages patients from disclosing their condition, seeking healthcare services, and practicing preventive behaviors (WHO, 2024).

Implications for Tuberculosis Control

The findings of this study indicate that both knowledge and attitudes significantly influence tuberculosis prevention efforts among pulmonary tuberculosis patients. Therefore, interventions aimed at improving patient knowledge and fostering positive attitudes should become an integral component of tuberculosis control programs. Health promotion activities should focus not only on increasing awareness of tuberculosis transmission and prevention but also on addressing misconceptions and stigma associated with the disease. Community-based educational programs, counseling sessions, and patient support groups may enhance preventive behaviors and contribute to reducing tuberculosis transmission at the community level. Overall, this study demonstrates that improving knowledge and attitudes among pulmonary tuberculosis patients may strengthen prevention efforts and support the achievement of national and global tuberculosis control targets.

CONCLUSION

This study demonstrated that the majority of pulmonary tuberculosis patients in the working area of Singkawang Utara 1 Public Health Center had poor knowledge regarding tuberculosis, negative attitudes toward tuberculosis prevention, and inadequate tuberculosis prevention efforts. Statistical analysis revealed a significant relationship between knowledge and tuberculosis prevention efforts ($p = 0.000$), as well as between attitudes and tuberculosis prevention efforts ($p = 0.028$). These findings indicate that knowledge and attitudes are important determinants of tuberculosis prevention behaviors among pulmonary tuberculosis patients. Patients with better knowledge and more positive attitudes were more likely to engage in appropriate preventive practices, including adherence to treatment, implementation of cough etiquette, use of protective measures, and efforts to prevent disease transmission within their households and communities. Therefore, improving patients' knowledge and fostering positive attitudes toward tuberculosis prevention may contribute significantly to strengthening prevention efforts and reducing the transmission of tuberculosis in the community.

Recommendations

Based on the findings of this study, several recommendations can be proposed:

1. For Healthcare Providers

Healthcare professionals should strengthen health education and counseling programs for tuberculosis patients, focusing on disease transmission, treatment adherence, cough etiquette, environmental sanitation, and preventive behaviors. Educational interventions should be delivered continuously throughout the treatment period to improve patients' knowledge and attitudes.

2. For Public Health Centers

Public health centers should develop community-based health promotion programs and support groups for tuberculosis patients and their families. These programs may help

reduce misconceptions, improve awareness, and minimize stigma associated with tuberculosis.

3. For Policymakers

Health authorities should integrate behavioral and educational interventions into tuberculosis control programs to complement medical treatment strategies. Policies aimed at increasing public awareness and reducing tuberculosis-related stigma are essential for achieving national tuberculosis control targets.

4. For Future Researchers

Future studies should involve larger sample sizes and multiple healthcare facilities to improve the generalizability of findings. Researchers are also encouraged to investigate additional factors influencing tuberculosis prevention behaviors, such as family support, health literacy, socioeconomic status, and access to healthcare services.

Overall, strengthening knowledge and promoting positive attitudes among pulmonary tuberculosis patients should become a priority strategy in tuberculosis prevention and control programs to support the achievement of national and global tuberculosis elimination goals.

REFERENCES

- [1] Agustina, S., & Wahjuni, C. U. (2017). Knowledge and Preventive Action of Pulmonary Tuberculosis Transmission in Household Contacts. *Jurnal Berkala Epidemiologi*, 5(1), 85–94. <https://doi.org/10.20473/jbe.V5I12017.85-94>
- [2] Ayu Andini Saleha, Joko Pramono, & Tini. (2024). Correlation of Knowledge Level with Prevention Practice of Tuberculosis Transmission among Household Contacts in Sungai Kunjang Sub-District, Samarinda City. *International Journal of Scientific Multidisciplinary Research*, 2(3 SE-Articles), 195–206. <https://doi.org/10.55927/ijsmr.v2i3.8453>
- [3] Daradkeh, A. F., Alawyia, B., Ballas, H., Spervnasilis, N., & Alon-Ellenbogen, D. (2025). Strategies for Tuberculosis Prevention in Healthcare Settings: A Narrative Review. *Tropical Medicine and Infectious Disease*, 10(11). <https://doi.org/10.3390/tropicalmed10110316>
- [4] Fang, L., Zhang, Q., Zhou, N., Chen, J., & Lou, H. (2025). Influencing factors and mechanisms promoting proactive health behavior intention: an integration of the health belief model and the theory of planned behavior. *Frontiers in Public Health*, 13, 1629046. <https://doi.org/10.3389/fpubh.2025.1629046>
- [5] Fox, G. J., Nguyen, T. A., Coleman, M., Trajman, A., Velen, K., & Marais, B. J. (2021). Implementing tuberculosis preventive treatment in high-prevalence settings. *International Journal of Infectious Diseases*, 113, S13–S15. <https://doi.org/10.1016/j.ijid.2021.02.094>
- [6] Guardia Zuñiga, R. C., de Vite, B. V., Azañero Suarez, A., Espino Carrasco, D. K., García Santos, E., Lajo Aquise, I. E., & Cachay Sánchez, I. (2025). Educational Level Mediates the Relationship Between Knowledge and Preventive Practices in Multidrug-Resistant Tuberculosis Patients. *Epidemiologia*, 6(4). <https://doi.org/10.3390/epidemiologia6040075>
- [7] Jia, C., & Qi, H. (2024). Users' health information sharing behavior in social media: an

- integrated model. *HUMANITIES AND SOCIAL SCIENCES COMMUNICATIONS*, 1–10. <https://doi.org/10.1057/s41599-024-04188-7>
- [8] Johnson, T. S., Nanziri, L., Gupta, A. J., Ggita, J. M., Armstrong-Hough, M., Ayakaka, I., Sheno, S. V., Katamba, A., & Davis, J. L. (2026). Effectiveness of routine tuberculosis education in a high-burden setting: A prospective observational cohort study. *PLoS One*, 21(3), e0344250. <https://doi.org/10.1371/journal.pone.0344250>
- [9] Juliasih, N. N., Sakinah, L. F., Sari, R. M., Winarso, H., Siahaan, S. C. P. T., & Gunawan, E. J. (2024). Determinants of transmission prevention behavior among Tuberculosis patients in Surabaya, Indonesia. *Infection Prevention in Practice*, 6(4), 100404. <https://doi.org/https://doi.org/10.1016/j.infpip.2024.100404>
- [10] Kim, H.-Y., Shin, S.-H., & Lee, E.-H. (2022). Effects of Health Belief, Knowledge, and Attitude toward COVID-19 on Prevention Behavior in Health College Students. *International Journal of Environmental Research and Public Health*, 19(3). <https://doi.org/10.3390/ijerph19031898>
- [11] Krishnamoorthy, Y., Selvaraja, C., & Govindan, D. (2025). Determinants of delays in the tuberculosis care pathway and adverse treatment outcomes in Chennai, South India: A retrospective cohort study. *Clinical Epidemiology and Global Health*, 35, 102123. <https://doi.org/https://doi.org/10.1016/j.cegh.2025.102123>
- [12] Madebo, M., Balta, B., & Daka, D. (2023). Knowledge, attitude and practice on prevention and control of pulmonary tuberculosis index cases family in Shebedino District, Sidama Region, Ethiopia. *Heliyon*, 9(10), e20565. <https://doi.org/https://doi.org/10.1016/j.heliyon.2023.e20565>
- [13] Masudi, M., Hamidi, A. W., Rahimi, A., & Shayan, N. A. (2025). Assessment of Knowledge, Attitude, and Practice Toward Tuberculosis: A Cross-Sectional Study in Balkh, Afghanistan. *Health Science Reports*, 8(10), e71338. <https://doi.org/10.1002/hsr2.71338>
- [14] Matchanova, A., Sheppard, D. P., Medina, L. D., Morgan, E. E., & Woods, S. P. (2023). Health literacy mediates the effects of educational attainment on online pharmacy navigation skills in older adults with HIV disease. *Psychology & Health*, 38(3), 348–368. <https://doi.org/10.1080/08870446.2021.1960990>
- [15] Pramono, J. S., Purwanto, E., & Ardiyanti, D. (2018). The Role of Knowledge about Early Detection of Tuberculosis in Identifying Suspected Cases Among Household Contacts. *Borneo Husada Proceedings*, 19–28.
- [16] Rivera-Lozada, O., Galvez, C. A., Castro-Alzate, E., & Bonilla-Asalde, C. A. (2021). Factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru. *F1000Research*, 10, 582. <https://doi.org/10.12688/f1000research.53689.3>
- [17] Shihora, J., Damor, N. C., Parmar, A., Pankaj, N., & Murugan, Y. (2024). Knowledge, Attitudes, and Preventive Practices Regarding Tuberculosis Among Healthcare Workers and Patients in India: A Mixed-Method Study. *Cureus*, 16(3), e56368. <https://doi.org/10.7759/cureus.56368>
- [18] Sulis, G., Roggi, A., Matteelli, A., & Raviglione, M. C. (2014). Tuberculosis: epidemiology and control. *Mediterranean Journal of Hematology and Infectious Diseases*, 6(1), e2014070. <https://doi.org/10.4084/MJHID.2014.070>

- [19] WHO. (2024). *Global tuberculosis report 2024*. https://www.who.int/teams/global-programme-on-tuberculosis-and-lung-health/tb-reports/global-tuberculosis-report-2024?utm_source=chatgpt.com
- [20] WHO. (2026). *Tuberculosis*. WHO. https://www.who.int/health-topics/tuberculosis#tab=tab_1
- [21] Wongchana, T., & Songthap, A. (2024). Factors affecting tuberculosis (TB) prevention behaviors among household contacts in Phitsanulok Province, northern Thailand: implications for TB prevention strategy plan. *BMC Infectious Diseases*, 24(1), 1429. <https://doi.org/10.1186/s12879-024-10327-x>
- [22] Zhang, Y., Wu, J., Hui, X., Zhang, P., & Xue, F. (2024). Knowledge, attitude, and practice toward tuberculosis prevention and management among household contacts in Suzhou Hospital, Jiangsu province, China. *Frontiers in Public Health*, 12, 1249971. <https://doi.org/10.3389/fpubh.2024.1249971>

HALAMAN INI SENGAJA DIKOSONGKAN