Level of Knowledge and Attitudes of Pulmonary Tuberculosis Patients Toward Medication Adherence in the Working Area of Ciwaruga Community Health Center

Annisa[1], Dewi Wulantresna[2]
[1]Politeknik Piksi Ganesha, Bandung, Indonesia, annisasepti9999@gmail.com
[2]Politeknik Piksi Ganesha, Bandung, Indonesia, dewiwulanpiksi@gmail.com

Corresponding Author: annisasepti9999@gmail.com[1]

Abstract: Pulmonary tuberculosis (TB) remains a major public health issue in Indonesia, with treatment adherence varying among patients. The success of TB therapy is strongly influenced by patients' knowledge and attitudes toward medication, as well as social and family support. This study aims to describe the level of knowledge and attitudes of pulmonary TB patients toward medication adherence at Ciwaruga Public Health Center in 2025. This research used a quantitative descriptive method involving 30 pulmonary TB patients undergoing anti-tuberculosis drug (OAT) treatment at Ciwaruga Public Health Center. Respondents were selected using purposive sampling. The research instruments consisted of a knowledge questionnaire (10 true–false items) and an attitude questionnaire (10 Likert-scale items). Data were analyzed using frequency distribution and percentage. Most respondents had moderate (43.3%) and high (40%) levels of knowledge, while 16.7% had low knowledge. Regarding attitudes, 46.6% had a fairly positive attitude, 36.7% had a good attitude, and 16.7% had a poor attitude. The analysis revealed that higher knowledge tends to be associated with more positive attitudes toward medication adherence. Patients' knowledge and attitudes significantly affect their adherence to TB treatment. Continuous education, family involvement, and regular monitoring by health workers are essential to improve treatment outcomes.

Keyword: Knowledge, Attitude, Adherence, Pulmonary Tuberculosis, Ciwaruga Health Center

INTRODUCTION

Pulmonary tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* (World Health Organization [WHO], 2023). Most TB bacteria attack the lungs; however, they can also affect other organs of the body. The WHO (2021, 2023) reports that TB is among the top ten causes of death worldwide and is the leading cause of death from a single infectious agent. Globally, in 2021 there were 9.87 million TB cases, with 4.27 million cases in the Southeast Asia region. Indonesia ranked third after India and China, with an estimated 824,000 new cases per year (WHO, 2021; WHO, 2023). In Indonesia, more than

500,000 new TB cases are estimated to occur annually, with the mortality rate remaining high (TB Indonesia, 2021). Data indicate that West Java is the province with the highest number of TB cases. Based on the West Java Health Profile (2016), of 30,047 smear-positive (BTA+) TB cases treated, only 76.24% were declared cured, which is still below the national target of 85% (West Java Provincial Health Office, 2016). In 2022, 724,000 new TB cases were identified, increasing to 809,000 cases in 2023 (WHO, 2023).

The success of TB treatment is strongly influenced by the level of patient adherence to medication. Reported rates of medication adherence vary widely, ranging from 4% to 92% across studies. Non-adherence can lead to treatment failure, drug resistance, and increased mortality. Several factors influencing patient adherence include age, occupation, family support, supervision, type of medication, as well as patients' knowledge and attitudes (Mekonnen & Azagew, 2018; Sazali et al., 2022). Good knowledge and positive attitudes can enhance patients' awareness and motivation to recover. Recent studies indicate that patients' levels of knowledge and attitudes are significantly associated with the success of TB therapy. Yani (2022) found that patients with higher levels of knowledge tended to demonstrate better adherence to treatment, especially when supported by family members and healthcare providers. In addition, Lolong (2023) revealed that medication side effects, social stigma, and work-related burdens are factors that reduce patient adherence in completing TB treatment. These findings highlight the importance of assessing patients' levels of knowledge and attitudes to understand variations in their adherence to therapy.

Through the Sustainable Development Goals (SDGs), the government aims to reduce TB mortality by 90% and TB incidence by 80% by 2030 compared to 2015 (WHO, 2023). However, as of 2023, there were still 47 cases of pulmonary TB in the working area of the Ciwaruga Community Health Center. This condition indicates the need for studies examining factors that influence patient adherence to medication, particularly from the perspective of patients' levels of knowledge and attitudes toward pulmonary TB. This situation underscores the need to examine factors affecting medication adherence, especially patients' levels of knowledge and attitudes toward pulmonary TB. In addition to describing patients' knowledge and attitudes, this study also analyzes the tendency of the relationship between these two variables and medication adherence.

Based on these issues, this study focuses on three main research questions:
1. What is the level of knowledge of pulmonary TB patients regarding medication adherence in the working area of the Ciwaruga Community Health Center?
2. What is the level of attitudes of pulmonary TB patients toward medication adherence in the working area of the Ciwaruga Community Health Center?
3. What is the descriptive relationship between the levels of knowledge and attitudes of pulmonary TB patients and their medication adherence in the working area of the Ciwaruga Community Health Center?

In line with these research questions, the objectives of this study are:
1. To determine the level of knowledge of pulmonary TB patients regarding medication adherence in the working area of the Ciwaruga Community Health Center;
2. To determine the level of attitudes of pulmonary TB patients toward medication adherence in the working area of the Ciwaruga Community Health Center; and
3. To analyze the descriptive relationship between the levels of knowledge and attitudes of pulmonary TB patients and their medication adherence.

METHOD

This study is a descriptive quantitative study aimed at describing the level of knowledge and attitudes of pulmonary TB patients toward medication adherence in the working area of the Ciwaruga Community Health Center. A quantitative approach was used because the data were collected in numerical form through questionnaires and analyzed using simple statistical

techniques (Sugiyono, 2022; Notoatmodjo, 2020). In addition to descriptive analysis, this study also employed cross-tabulation analysis to explore the descriptive relationship between patients' levels of knowledge and attitudes. This cross-tabulation analysis was not intended to test statistical significance, but rather to identify trends or patterns of relationships based on data distribution (Creswell, J. W., 2014).

1. Research Location and Time

The study was conducted at the DOTS Clinic of the Ciwaruga Community Health Center, West Bandung Regency, West Java Province. Data collection took place from October to January 2026, using population data of pulmonary TB patients recorded in the patient register from January to September 2025.

2. Determination of Research Site

The research was carried out at the DOTS Clinic of the Ciwaruga Community Health Center. Interviews were conducted directly with patients who came to collect anti-tuberculosis drugs (OAT) at the Ciwaruga Community Health Center. For patients who did not attend according to their scheduled medication pickup, interviews were conducted by telephone to ensure that data could still be obtained.

3. Population and Sample

The study population consisted of all pulmonary TB patients undergoing OAT treatment at the Ciwaruga Community Health Center during the period January–September 2025, totaling 32 patients based on the TB Patient Register of the Ciwaruga Community Health Center (2025). The sampling technique used was purposive sampling, namely the selection of respondents based on specific criteria relevant to the objectives of the study (Notoatmodjo, 2020).

Based on the supervisor's guidance, the minimum sample size taken was 30 patients ($\geq$ 90% of the population) to ensure that the research results remained representative.

4. Inclusion criteria:

1. Pulmonary TB patients who are currently undergoing OAT treatment at the Ciwaruga Community Health Center.
2. Aged $\geq$ 18 years.
3. Willing to participate as respondents and complete the questionnaire.

Exclusion criteria:

1. Pediatric TB patients under 18 years of age.
2. Patients who refuse or cannot be interviewed.
3. Patients with physical or mental conditions that prevent them from completing the questionnaire.

Based on patient register data, the population composition is as follows:

1. Total pulmonary TB patients: 32 individuals
2. Male: 15 individuals (46.9%)
3. Female: 17 individuals (53.1%)
4. Age range: 0–67 years, with a predominance of productive age (18–49 years)
5. Patient visits were distributed monthly from January to September 2025.

5. Research Instrument

The research instrument used was a structured questionnaire developed by the researcher based on the Health Belief Model (HBM) theory and the TB control guidelines issued by the

Ministry of Health of the Republic of Indonesia (MoH RI, 2023). The questionnaire was used to measure two main variables:
1. Level of knowledge of pulmonary TB patients regarding the disease and its treatment (Variable X1)
2. Attitudes of pulmonary TB patients toward medication adherence (Variable X2)

a) Questionnaire Structure
The questionnaire consisted of three main sections:

Section I. Respondent Identity
This section contained general data including:
1. Respondent code
2. Gender
3.Age
4. Highest level of education
5. Occupation
6. Duration of OAT treatment
7. Month of last visit to the DOTS Clinic

The purpose of this section was to identify the basic characteristics of the respondents.

Section II. Patient Knowledge Questionnaire on Pulmonary TB (Variable X1)
This section aimed to assess the extent to which patients understand pulmonary TB, including its transmission, treatment, and the importance of adherence to OAT.
Each statement was provided with answer options "True" (score 1) and "False" (score 0).

Table 1. Knowledge Statements

No.	Knowledge Statements	Answer Options
1	Pulmonary TB is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*.	True / False
2	Pulmonary TB can only be transmitted through food and drinks.	True / False
3	The main symptom of pulmonary TB is a productive cough lasting two weeks or more.	True / False
4	Pulmonary TB cannot be cured even if treated regularly.	True / False
5	Treatment of pulmonary TB must be carried out regularly for six months or longer.	True / False
6	If the patient feels healthy, the treatment may be discontinued.	True / False
7	Discontinuing pulmonary TB treatment prematurely can cause relapse or drug resistance.	True / False
8	Anti-tuberculosis drugs (OAT) must be taken daily according to healthcare workers' instructions.	True / False
9	Pulmonary TB can relapse if the patient is not adherent to taking medication.	True / False
10	Pulmonary TB patients who have recovered do not need follow-up visits to the community health center.	True / False

Knowledge Scoring:
Correct answer = 1 point, incorrect answer = 0 points
Total score = sum of correct answers

Categories:
0–4 : Low knowledge
5–7 : Moderate knowledge
8–10 : High knowledge

Section III. Attitude Questionnaire Toward Adherence to Taking OAT (Variable X2)
This section is used to assess patients' feelings, beliefs, and commitment in carrying out their treatment. Each statement uses a 4-point Likert scale, as follows:
1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Agree (A)
4 = Strongly Agree (SA)

Table 2. Attitude Statements

No.	Attitude Statements	Scale (1–4)
1	I believe that pulmonary TB can be cured if I take the medication regularly.	1–4
2	I feel that pulmonary TB treatment takes too long, so I often feel bored.	1–4
3	I continue taking the medication even when I already feel healthy.	1–4
4	I believe that forgetting to take the medication once does not have a major effect on recovery.	1–4
5	I feel that taking TB medication every day is very important for recovery.	1–4
6	I feel embarrassed to come to the community health center to collect TB medication.	1–4
7	I believe that my family supports me in recovering from TB.	1–4
8	I always remember my medication schedule with the help of an alarm or other reminders.	1–4
9	I am not afraid of medication side effects because they have been explained by healthcare workers.	1–4
10	I stop taking the medication if no one reminds me.	1–4

Attitude Scoring:
Positive statements are scored according to their values (SA = 4, A = 3, D = 2, SD = 1).
Negative statements are reverse-scored (SA = 1, A = 2, D = 3, SD = 4).
Final Categories:
10–24 : Poor attitude
25–34 : Fair attitude
35–40 : Good attitude

b) Instrument Validity and Reliability
The instrument was first pilot-tested on 10 TB patients outside the study sample (for example, at a neighboring community health center) to assess content validity, which was evaluated by the academic supervisor and TB officers. Internal reliability was tested using Cronbach's Alpha ($\alpha \geq 0.7$ was considered reliable). The instrument was deemed suitable for use after the validity and reliability test results met the established criteria (Sugiyono, 2022).

c) Scoring and Interpretation Technique
The total scores from both variables were used to analyze the relationship between levels of knowledge and attitudes toward medication adherence. The scoring results were then processed using descriptive analysis and presented in the form of frequency distribution tables.

5. Research Ethics
This study obtained official permission from the Ciwaruga Community Health Center and was conducted in accordance with the principles of health research ethics. The ethical principles applied included:

1. Informed Consent

Each respondent was first provided with a clear explanation of the study's objectives, benefits, and procedures. Respondents were then asked to give voluntary consent before participating in the questionnaire.

2. Data Confidentiality

All personal data and respondent identities were kept confidential. The information collected was used solely for research purposes and was presented anonymously without including respondents' names.

3. Respondent Safety and Comfort (Non-Maleficence & Beneficence)

The researcher ensured that the entire data collection process was conducted without coercion and did not pose any physical or psychological risks to the respondents.

The application of these three principles is consistent with the ethical guidelines outlined in the Indonesian Health Research Ethics Code (Ministry of Health of the Republic of Indonesia, 2022).

RESULTS AND DISCUSSION

1. Respondent Characteristics

This study involved 30 pulmonary TB patients at the Ciwaruga Community Health Center. Based on questionnaire data, the respondents' characteristics were as follows:

Table 3. Respondent Characteristics

Characteristic	Category	Frequency (f)	Percentage (%)
Gender	Male	18	60.0
	Female	12	40.0
Age	20–30 years	10	33.3
	31–40 years	8	26.7
	41–50 years	7	23.3
	>50 years	5	16.7
Highest Education	Elementary–Junior High School	9	30.0
	Senior High School	14	46.7
	Higher Education	7	23.3

Interpretation:

The majority of respondents were male (60%), with the largest age group being 20–30 years (33.3%), and most had a senior high school education (46.7%). This indicates that TB patients in this area are predominantly of productive age with a moderate level of education.

2. Analysis of Knowledge Variable (X1)

Knowledge was measured using 10 questionnaire items covering the definition of TB, causes, symptoms, transmission, and the importance of medication adherence.

Table 4. Analysis of Knowledge Variable (X1)

Knowledge Category	Frequency (f)	Percentage (%)
High (76–100)	12	40.0
Moderate (56–75)	13	43.3
Low (≤55)	5	16.7
Total	30	100.0

Interpretation:

Most respondents had a moderate level of knowledge (43.3%), followed by high knowledge (40%) and low knowledge (16.7%). This suggests that information about pulmonary TB is fairly well disseminated; however, further education is still needed to improve patients' knowledge.

Notoatmodjo (2020) states that knowledge is the result of an individual's awareness of an object through the senses and forms the basis for the development of health-related attitudes and behaviors.

3. Analysis of Attitude Variable (X2)

Attitudes were measured using 10 questionnaire items covering willingness to take medication regularly, discipline in follow-up visits, and support for the TB program.

Table 5. Analysis of Knowledge Variable (X1)

Attitude Category	Frequency (f)	Percentage (%)
Good (76–100)	11	36.7
Fair (56–75)	14	46.6
Poor (≤55)	5	16.7
Total	**30**	**100.0**

Interpretation:

Most patients had a fair attitude (46.6%), indicating awareness of the importance of medication adherence but not yet fully consistent behavior. According to the Ministry of Health (2023), positive attitudes toward TB treatment can improve treatment success rates and reduce relapse.

4. Analysis of the Relationship Between Knowledge and Attitude

To examine the descriptive relationship between patients' knowledge and attitudes, cross-tabulation analysis was conducted using SPSS.

Table 6. Analysis of the Relationship Between Knowledge and Attitude

Knowledge Level	Good Attitude	Fair Attitude	Poor Attitude	Total
High	8 (26.7%)	3 (10.0%)	1 (3.3%)	12 (40.0%)
Moderate	3 (10.0%)	8 (26.7%)	2 (6.6%)	13 (43.3%)
Low	0 (0%)	3 (10.0%)	2 (6.7%)	5 (16.7%)
Total	11 (36.7%)	14 (46.7%)	5 (16.6%)	30 (100%)

Interpretation:

The descriptive analysis shows that respondents with high knowledge tended to have good attitudes (26.7%), while those with low knowledge were more likely to have poor attitudes (6.7%). This indicates a positive tendency between knowledge and attitudes toward adherence to pulmonary TB medication. This finding is consistent with the study by Nugroho et al. (2022), which reported that increasing patients' knowledge significantly influences changes in attitudes and adherence behaviors toward therapy.

The results show that most respondents had a moderate level of knowledge (43.3%) and a high level of knowledge (40.0%), with only a small proportion having low knowledge (16.7%). These findings indicate that most patients already understand the basic aspects of pulmonary TB, such as its causes, symptoms, and the importance of taking anti-tuberculosis drugs (OAT) regularly. However, some respondents still lacked understanding of the risk of drug resistance and the long duration of treatment. According to Notoatmodjo (2020), knowledge is an important factor in shaping an individual's health attitudes and behaviors. This means that improving patients' knowledge through appropriate education can strengthen adherence to pulmonary TB treatment. Continuous education provided by healthcare workers and community health volunteers should therefore be prioritized to maintain patients' understanding and adherence to OAT therapy.

Patients' Attitudes Toward Adherence to Taking OAT

The majority of respondents demonstrated fairly good attitudes (46.6%) and good attitudes (36.7%), while a small proportion still showed poor attitudes (16.7%). Positive attitudes indicate awareness and motivation to recover, although some respondents admitted feeling bored, forgetful, or fatigued due to the long-term treatment. The Ministry of Health of the Republic of Indonesia (2023) explains that positive attitudes encourage adherence behavior when supported by external factors such as family support and healthcare workers. Therefore, the role of healthcare providers in delivering motivation and psychological support is crucial in maintaining patients' consistency throughout the treatment process.

Relationship Between Knowledge and Attitudes

The study results indicate a tendency for patients with higher levels of knowledge to have better attitudes toward medication adherence. This is consistent with health behavior theory, which states that good knowledge shapes positive attitudes and ultimately promotes healthy behavior (Notoatmodjo, 2020). As this study is descriptive in nature, this tendency cannot be interpreted as a statistically significant relationship; however, it is sufficient to illustrate an initial pattern of association that is relevant for the development of educational interventions.

External Supporting (Contextual) Factors

In addition to the two main variables, adherence to pulmonary TB treatment is also influenced by external factors that were not the primary focus of this study. Family support and healthcare worker assistance act as contextual factors that strengthen adherence behavior. Patients who receive encouragement, supervision, and reminders from family members tend to be more consistent in taking their medication and attending routine follow-up visits. This is in line with Manik et al. (2024), who stated that social support can enhance patients' motivation in undergoing long-term treatment. Healthcare workers also play a vital role in providing education, monitoring, and counseling to prevent patients from discontinuing therapy prematurely. These external factors enrich the understanding of the context of adherence but were not quantitatively measured variables in this study.

Implications and Recommendations

The study findings highlight the need for enhanced targeted education and stronger social support. Healthcare providers should develop simple reminder strategies (such as alarms or text messages) and involve family members in monitoring medication intake. In addition, education should emphasize the risk of drug resistance if patients are non-adherent. According to Sugiyono (2022), descriptive research findings can be used to formulate policies based on local data; therefore, the Ciwaruga Community Health Center can use these findings as a basis for strengthening community-based TB control programs.

CONCLUSION

Based on the results of the study on the relationship between levels of knowledge and attitudes toward medication adherence among pulmonary TB patients at the Ciwaruga Community Health Center in 2025, the following conclusions were drawn:
1. The majority of patients' knowledge levels fell into the moderate and high categories. This indicates that most patients have understood the causes, symptoms, and the importance of regular treatment for pulmonary TB.
2. Patients' attitudes toward adherence to taking anti-tuberculosis drugs (OAT) were mostly categorized as fairly good and good. This means that respondents have commitment and confidence in recovering through treatment adherence, although some still face obstacles such as boredom and forgetting to take medication.

3. There is a descriptive tendency indicating a positive relationship between levels of knowledge and attitudes toward treatment adherence. This finding does not demonstrate a statistically significant relationship because the analysis used was descriptive in nature; however, the data pattern shows that higher patient knowledge is associated with better attitudes in undergoing OAT therapy.
4. External factors such as family support and healthcare workers also strengthen patients' adherence behavior. Consistent assistance, motivation, and education help patients maintain positive behaviors throughout the therapy period, even though these factors were not the main variables of the study.

Thus, patients' knowledge and attitudes play an important role in supporting the success of pulmonary TB control programs at the primary healthcare level, such as the Ciwaruga Community Health Center.

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