

## Effect of Health Education on Knowledge and Attitudes of Pulmonary Tuberculosis Patients in Ambon

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### Abstract

**Background:** Pulmonary Tuberculosis (TB) is currently still a public health problem both in Indonesia and internationally so that it becomes one of the goals of sustainable health development. **Objective:** This study aims to determine the influence of health education on the level of knowledge and attitudes of pulmonary tuberculosis patients at the Air Besar Ambon Community Health Center. **Method:** This type of research is Pre-Experimental Designs with a One-Group Pretest-Posttest Design approach. This research was conducted at the Air Besar Ambon Community Health Center. The population in this study amounted to 46 people and the sample amounted to 37 people with a purposive sampling technique. The research instruments were questionnaires and leaflets. **Results:** The results of the study were analyzed using the Wilcoxon test and obtained a sig. (2-tailed) value or p value = 0.000 which means  $H_a$  is accepted where there is a significant influence between health education on the level of knowledge and attitudes of pulmonary tuberculosis patients at the Air Besar Ambon Community Health Center. **Discussion:** Based on the research results, it can be concluded that there was an increase in the level of knowledge and attitudes before and after health education. Therefore, disseminating information through health education can impact patient knowledge and attitudes, thereby changing patient attitudes for the better and reducing the risk of transmission to others. **Conclusion:** Therefore, future researchers or related agencies should continue to conduct health education to improve public health.

**Keywords:** attitude, health education, knowledge, pulmonary tuberculosis

### INTRODUCTION

Pulmonary tuberculosis (TB) remains a public health problem both in Indonesia and internationally, making it one of the goals of sustainable health development [1]. Tuberculosis (TB) is an infectious disease caused by the bacterium *Mycobacterium tuberculosis* and is one of the 10 leading causes of death worldwide. Non-adherence to treatment in TB patients can lead to low cure rates, high mortality rates, and an increased risk of relapse. Knowledge is crucial for pulmonary tuberculosis (TB) patients to increase awareness and ensure adherence to treatment [2].

According to the 2024 Global TB Report, Indonesia ranks second in the world for the highest number of pulmonary tuberculosis (TB) cases after India, followed by China. With an estimated 1,060,000 cases of pulmonary tuberculosis (TB) and 134,000 deaths from pulmonary tuberculosis (TB) per year in Indonesia, 17 people die from TB every hour [3].

The Maluku Provincial Health Office stated that Maluku Province was ranked 18th out of 34 provinces with 4,334 cases of pulmonary tuberculosis (TB) in 2019, 5,476 cases in 2020, and around 6,871 cases in 2021. Maluku Province is estimated to contribute 20% of the total national pulmonary TB cases in 2024 [4].

Ambon City itself ranks first with the highest number of tuberculosis cases in Maluku, with pulmonary tuberculosis (TB) contributing 65% of these cases. Based on data obtained in 2020, there were 716 cases of tuberculosis in Ambon City, 916 cases in 2021, in 2022 reaching 1,107 cases, and in 2023 reaching 1,175 cases of pulmonary tuberculosis (TB) in Ambon City. The number of tuberculosis cases in Ambon City has increased in the last 3 years. There were 494 cases in Sirimau sub-district [5]. Data from medical records from the Air Besar Ambon Community Health Center in 2024 showed 118 cases of pulmonary tuberculosis, and from January to April 2025, there were 37 cases of pulmonary tuberculosis, with 21 men and 16 women.

Tuberculosis transmission occurs when a patient with a positive sputum test result coughs or clears their throat, releasing the bacteria into the air in the form of droplets. A single cough can produce approximately 3,000 droplets. Transmission generally occurs indoors where the droplets remain suspended in the air for extended periods. Ventilation can reduce the number of droplets, while direct sunlight can kill the tuberculosis bacteria [6].

Transmission of pulmonary tuberculosis (TB) is greatly influenced by the knowledge and attitudes of TB patients themselves, because factors that cause faster transmission to others are ignorance and bad habits of TB patients, such as spitting, cleaning, and coughing carelessly. Changes in attitudes are closely related to health education, therefore the role of health education is very important in improving community behavior to be free from health problems. Patients who do not undergo regular treatment are at risk of relapse and resistance. Patients who do not understand the treatment regimen often complain of unpleasant side effects on the body [7].

Previous research shows that 34.4% of respondents have insufficient knowledge regarding adherence to taking anti-tuberculosis medication [8]. Based on previous research, it was found that 50% of respondents had insufficient knowledge about pulmonary TB and 92.9% of respondents who had insufficient knowledge did not use masks [9]. Based on previous research, it was found that 38.1% of respondents with negative attitudes were non-compliant in taking medication [10]. Based on previous research, it was found that 40.8% of tuberculosis patients had negative attitudes towards tuberculosis. Bad attitudes include the habit of sufferers spitting in random places, irregular treatment, coughing without covering their mouths [11].

Interviews and surveys conducted by researchers on May 2, 2025, at the Air Besar Ambon Community Health Center found that of the five patients, two said they did not fully understand that pulmonary TB treatment must be carried out for 6 months, one said they sometimes forgot to cover their mouth when coughing, and another was seen frequently removing their mask when taking medication. When asked, these patients said they sometimes felt short of breath or short of breath. In addition, one patient came without a mask, stating that they only covered their mouth with a tissue when sneezing or coughing.

Education is an effort to ensure that individual, group, or community behavior positively influences health maintenance and improvement. Education can improve patients' knowledge and attitudes regarding the treatment they require and the prevention measures they can take to prevent infection.

From previous research, there were differences in the knowledge and attitudes of TB patients in efforts to prevent the transmission of tuberculosis after being given Health Education [12]. Other findings showed that there was an influence of health education on knowledge, attitudes and actions as an effort to reduce the risk of transmission of Pulmonary TB by families of Pulmonary TB sufferers [13].

## **METHOD**

The research design used was a pre-experimental design with a one-group pretest-posttest approach. This method involved a single group of subjects to reveal the causal relationship. Before the intervention, the group of subjects was observed and then observed again after the intervention [12].

### **Study site and samples**

The study population comprised 46 patients with pulmonary tuberculosis registered at the Air Besar Ambon Community Health Center, as identified from medical records between January and April 2025. A total of 37 respondents were selected using a non-probability purposive sampling technique. To minimize selection bias, participants were recruited based on predefined inclusion and exclusion criteria. The inclusion criteria were: (1) patients undergoing treatment at the Air Besar Ambon Community Health Center, (2) newly diagnosed pulmonary tuberculosis patients, (3) individuals aged over 17 years, and (4) willingness to participate in the study. Patients who had relocated or transferred their treatment to another healthcare facility were excluded.

### **Instrument**

The study utilized educational leaflets, a lesson plan (SAP), and structured questionnaires as research instruments. Knowledge was assessed using an eight-item questionnaire with dichotomous response options (Yes/No). Positive items were scored as 1 for "Yes" and 0 for "No," whereas the scoring was reversed for negative items. Attitudes were measured using an eight-item Likert-scale questionnaire with response categories ranging from "Never" (1) to "Always" (4) for positive items, with reverse scoring applied to negative items.

The questionnaires were adapted from previously validated instruments. Item validity was established using a corrected item-total correlation threshold of  $r > 0.632$ , with all items meeting the validity criteria. Reliability testing demonstrated excellent internal consistency for the knowledge questionnaire (Cronbach's  $\alpha = 0.936$ ) and good internal consistency for the attitude questionnaire (Cronbach's  $\alpha = 0.837$ ).

### **Data analysis**

Data were analyzed using descriptive and inferential statistics. Descriptive analyses were presented as frequencies and percentages to summarize respondents' characteristics as

well as knowledge and attitude levels before and after the health education intervention. Prior to hypothesis testing, data normality was assessed using the Shapiro-Wilk test. As the pre- and post-intervention knowledge and attitude scores were not normally distributed ( $p < 0.05$ ), differences between measurements were evaluated using the Wilcoxon Signed-Rank Test. A significance level of 0.05 was applied for all statistical analyses.

## RESULTS AND DISCUSSION

The largest number of respondents studied were aged 18-34 years, totaling 22 people (59.5%), while the smallest number were aged  $\geq 60$  years, totaling 1 person (2.7%). The majority of respondents were male, totaling 23 people (62.2%). The majority of respondents had a high school/equivalent education level, totaling 24 people (64.9%), while the minority had a bachelor's degree, totaling 1 person (2.7%). The most common occupation among respondents was entrepreneur, totaling 9 people (24.3%), while the least common occupation was civil servant, totaling 1 person (2.7%) (Table 1).

Table 1. Respondent Characteristics (n= 37)

Variables	Frequency (n)	Percentage (%)
<b>Age</b>		
18-35 Years	22	59.5
36-45 Years	5	13.5
46-59 Years	9	24.3
$\geq 60$ Years	1	2.7
<b>Sex</b>		
Male	23	62.2
Female	14	37.8
<b>Education</b>		
Junior High School	10	27.0
Senior High School	24	64.9
Diploma	2	5.4
Bachelor's Degree	1	2.7
<b>Occupation</b>		
Housewife	6	16.2
Merchant	8	21.6
Entrepreneur	9	24.3
Temporary Employee	2	5.4
Civil Servant	1	2.7
Laborer	7	18.9
Unemployed	4	10.8

The proportion of respondents with good knowledge increased substantially following the educational intervention, rising from 16.2% (n = 6) at baseline to 83.8% (n = 31) post-intervention. Conversely, the proportion of respondents with a moderate level of knowledge decreased from 32.4% (n = 12) before the intervention to 16.2% (n = 6) after the intervention, indicating an overall improvement in knowledge levels among participants (Table 2).

Table 2. Knowledge levels before and after health education (n= 37)

Knowledge	Pre-test		Post-test	
	n	%	n	%
Good	6	16.2	31	83.8
Fair	12	32.4	6	16.2
Poor	19	51.4	0	0

Participants' attitudes improved markedly following the educational intervention. The proportion of respondents demonstrating a good attitude increased from 13.5% (n = 5) before the intervention to 75.7% (n = 28) afterward. Conversely, the proportion of respondents with a moderate attitude decreased from 32.4% (n = 12) at baseline to 24.3% (n = 9) post-intervention, indicating a positive shift in attitudes among participants (Table 3).

Table 3. Attitude levels before and after health education (n= 37)

Attitude	Pre-test		Post-test	
	N	%	N	%
Good	5	13.5	28	75.7
Fair	12	32.4	9	24.3
Poor	20	54.1	0	0

The Wilcoxon Signed-Rank Test revealed statistically significant differences in both knowledge and attitude scores before and after the educational intervention. For knowledge, the analysis yielded a p-value of 0.001 ( $p < 0.05$ ), indicating a significant improvement in participants' knowledge following the intervention. Similarly, attitude scores showed a significant change, with a p-value of 0.001 ( $p < 0.05$ ), demonstrating a positive effect of the intervention on participants' attitudes. These findings suggest that the health education program was effective in improving both knowledge and attitudes among patients with pulmonary tuberculosis at the Air Besar Ambon Community Health Center (Table 4).

Table 4. Knowledge and Attitudes score description (n= 37)

Variable	Mean	SD	SE	p-value
Pre-test knowledge	59.38	16.672	2.741	0.001
Post-test knowledge	88.49	8.752	1.439	
Pre-test attitude	17.57	3.279	0.539	0.001
Post-test attitude	26.32	2.310	0.380	

The results of this study show a significant increase in knowledge before and after health education. This increase in knowledge before and after health education, an increase in the number of respondents with a good level of knowledge and a decrease in respondents with a poor level of knowledge after health education. These results indicate that before health education, most respondents had a poor level of knowledge, but there was an increase in knowledge, with most respondents falling into the good category after health education.

This study is in line with previous research that examined the effect of health education using leaflets on the knowledge of pulmonary tuberculosis patients, showing an increase in patient knowledge before and after health education [14]. This is in line with the goal of health education, namely to increase public knowledge in order to change public behavior so that they are aware, knowledgeable, and able to take actions that support health, and play an active role in achieving optimal health in accordance with the concept of health, thereby reducing morbidity and mortality [15].

The majority of respondents in this study were adults, considered to be in the productive age group. According to the researchers' assumption, age influences a person's understanding and mindset. Maturity influences comprehension and the ability to better understand or study an object, thereby increasing the knowledge gained. This assumption is supported by previous research, which states that age is related to respondents' level of knowledge after being provided with information through education or counseling, thus increasing their knowledge.

The results of this study are in line with the theory that age can influence a person's knowledge; the older a person is, the more mature and stronger their thinking and working abilities are. The higher education category ranges from high school to college [16]. Most respondents in this study had a high school education. Researchers assume that education can also influence a person in increasing their knowledge. The higher a person's education, the easier it is for them to receive and understand the information obtained, thus increasing their knowledge. This assumption is supported by the findings of previous research, which found a significant relationship between education level and knowledge level [17].

The results of this study showed a significant improvement in patient attitudes before and after receiving health education. This result was reinforced by an improvement in attitudes after health education, where respondents with good attitudes were more dominant than respondents with bad attitudes [18]. The improvement in patient attitudes in the good category was also observed by the researchers, who noted that after counseling, respondents were more compliant in proper phlegm disposal, as evidenced by the questionnaire results showing improvement. Respondents were also able to practice proper cough etiquette, thereby minimizing the risk of transmission to others.

This study aligns with previous research on the influence of health promotion methods on the knowledge and attitudes of tuberculosis patients, showing a difference in average knowledge before and after health promotion. This difference indicates an improvement in the attitudes of tuberculosis patients in a positive direction [19]. Providing information can directly influence changes in the knowledge and attitudes of tuberculosis patients, which

can motivate them to behave better in carrying out various treatments that must be carried out [20].

The attitudes of tuberculosis patients towards treatment and prevention emphasize the importance of patient understanding and acceptance of the disease, as well as the important role of a positive attitude in supporting successful tuberculosis treatment and prevention [21]. A positive attitude will encourage adherence to treatment and the implementation of appropriate preventive behaviors, while a negative attitude can hinder the healing process and increase the risk of transmission. A positive attitude towards tuberculosis includes understanding the disease, awareness of the importance of treatment and prevention, and motivation to recover and prevent transmission [22].

Based on the results, the majority of respondents had a high school education or equivalent. Researchers believe that education plays a crucial role in the process of changing attitudes as individuals mature, and this shift is facilitated through teaching and training, one of which is providing health education to patients.

This assumption aligns with previous research, showing that most respondents had a high school education. The higher the respondents' formal education, the more supportive their attitudes were. This is because the higher a person's education level, the higher their expectations for attitude change. Education is defined as the process of changing the attitudes and behavior of individuals or groups of people in an effort to mature humans through teaching and training [23].

Based on the researchers' findings, before the counseling session, most respondents had inadequate knowledge and attitudes, whereas after the session, most respondents had good knowledge and attitudes. This suggests that a person's knowledge shapes their attitude toward an object or condition they are experiencing, in this case related to their treatment and the prevention of pulmonary tuberculosis transmission.

This opinion is supported by previous research, which found a significant relationship between knowledge and attitudes among adolescents. Analysis showed that adolescents with good knowledge were 12.8 times more likely to have positive attitudes than adolescents with poor knowledge [24].

Knowledge influences a person's attitudes and behavior, including their response to disease, their perception of the disease, knowledge of the causes and symptoms of the disease, disease treatment, and so on [25]. Researchers assume that the lack of knowledge before receiving counseling and educational background influences respondents' attitudes, causing them to deviate from treatment or prevention measures, which has a high potential to cause treatment failure or cure and a high potential for tuberculosis transmission. After receiving health education, there was a significant increase in respondents who gave a positive response. This is because respondents gained access to information in the form of education delivered using brochures, which increased their knowledge. Respondents received the information well, which led to a change in attitude for the better.

The results of the study, which involved administering questionnaires to measure the average level of knowledge and attitudes before and after the counseling session, showed a significant difference. These results indicate an increase in the knowledge and attitudes of pulmonary tuberculosis patients. This is also evident in the increase in correct answers on the knowledge questionnaire and a change in attitudes toward the "good" category on the attitude questionnaire. After the counseling session, respondents also showed a change in attitude toward the better, consistently practicing cough etiquette and taking medication on time compared to before the counseling session. The findings of this study indicate that health counseling has an impact on the level of knowledge and attitudes of pulmonary tuberculosis patients at the Air Besar Ambon Community Health Center.

This study aligns with previous research on the effect of health education using leaflets on improving public knowledge and attitudes about pulmonary tuberculosis [26]. Results obtained before education showed that the majority of knowledge was in the inadequate category, while after education, the majority of knowledge was in the adequate category. Furthermore, attitudes toward tuberculosis before education were mostly negative, while after education they were mostly positive. Therefore, it can be concluded that health education using leaflets has an effect on improving public knowledge and attitudes.

Similarly, previous research findings on the influence of health education on the knowledge and attitudes of pulmonary tuberculosis patients found that the level of knowledge of TB patients before being given health education about tuberculosis was mostly in the adequate category, while the level of knowledge of tuberculosis patients after being given health education was mostly in the good category [27]. The attitudes of tuberculosis patients before and after being given health education improved, indicating that health education about tuberculosis had an effect on the knowledge and attitudes of tuberculosis patients [28].

Based on the research results, the researchers assumed that the improvement in knowledge and attitudes was caused by the provision of health education to patients. This improvement in knowledge and attitudes was carried out through health education using brochures tailored to material related to treatment and prevention that can be applied by tuberculosis patients, making it easier for patients to obtain information to improve their understanding and knowledge and change their attitudes for the better regarding pulmonary tuberculosis. Therefore, health education is essential to make it easier for the public to understand and absorb useful information to increase their knowledge and facilitate their access to information.

## CONCLUSION

A significant improvement in the knowledge of patients with pulmonary tuberculosis was observed following the health education intervention, as reflected by the increased proportion of participants classified in the good knowledge category. Likewise, most respondents demonstrated more favorable attitudes toward pulmonary tuberculosis after receiving counseling, with the majority being categorized as having good attitudes. These

findings indicate that health education had a positive effect on both the knowledge and attitudes of patients with pulmonary tuberculosis.

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