International Journal of Health Science (IJHS)

E-ISSN: 2827-9603
P-ISSN: 2827-9603

Research Article

The Effect of Health Education About Tuberculosis on Knowledge and Attitudes Toward Preventing the Transmission of Tuberculosis in the Families of TB Patients at the Purbalingga Community Health Center

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Abstract: Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis and transmitted through the air when individuals with pulmonary TB cough and release bacteria that can be inhaled by others. Preventive efforts are necessary to reduce its spread, and health education is one strategy to increase public awareness. This study aimed to examine the effect of tuberculosis health education on the knowledge and attitudes of families in preventing TB transmission among patients' families at the Purbalingga Community Health Center. This quantitative study used a pre-experimental method with a one-group pre-test–post-test design. A total of 48 families of TB patients were selected using purposive sampling. Data were collected through questionnaires measuring respondents' knowledge and attitudes. Most respondents were female (79.2%), aged 46–55 years (39.6%), related to the patient as siblings (37.5%), and had a senior high school or vocational school education level (56.3%). The findings showed that knowledge improved from the adequate category before education (64.6%) to the good category after education (72.9%). Attitudes also changed significantly from mostly negative (66.7%) to positive (95.8%) after the intervention. Statistical analysis using the Paired Sample T-Test showed a p-value of 0.000 (<0.05), indicating a significant effect of health education on improving knowledge and attitudes toward preventing TB transmission. These results indicate that health education is an effective intervention to increase awareness and promote preventive behavior among families of TB patients.

Keywords: Attitude; Health Education; Knowledge; Tuberculosis; Transmission Prevention.

Received: January 23, 2025
Revised: February 27, 2025
Accepted: March 13, 2026
Online Available: March 18, 2026
Curr. Ver.: March 18, 2026

1. Introduction

Journal Tuberculosis is an infectious disease caused by Mycobacterium tuberculosis. It is transmitted through the air when a person with pulmonary tuberculosis coughs, releasing bacteria that can be inhaled by others during breathing. Therefore, preventive efforts are essential to minimize the spread of tuberculosis. One of the preventive measures that can be implemented is health education. Health education is an educational process that provides individuals with understanding, transforming them from a state of not knowing to knowing, and is intended to improve people's knowledge (Puspitasari et al., 2021). Data from the Global Tuberculosis Report 2023 recorded that approximately 8.2 million people worldwide were diagnosed with tuberculosis. This number increased compared to 2022, which reported 7.5 million new cases (World Health Organization, 2024).

Currently, Indonesia ranks second in the world for the highest number of tuberculosis cases, following India in first place and China in third. According to data from the Indonesian Ministry of Health, there were 889,133 tuberculosis cases in Indonesia in 2024. This number increased from 821,200 cases recorded in 2023 (Ministry of Health of the Republic of Indonesia, 2025). Data from the Central Java Data Portal reported that the number of

tuberculosis cases detected in Central Java reached 87,706 in 2024, an increase from 84,965 cases in 2023 (Central Java Data Portal, 2025). According to the Purbalingga District Health Office, there were 2,384 tuberculosis cases recorded in 2023, with an estimated case detection rate of 97.5%. Purbalingga Regency also recorded a Case Notification Rate (CNR) of 237 cases (Kusuma & Wardana, 2024). Data from the Purbalingga Community Health Center indicate that in 2023, 523 suspected tuberculosis cases were examined, with 31 newly identified cases (29 drug-sensitive TB cases and 2 drug-resistant TB cases), and 34 patients undergoing treatment. In 2024, 592 suspected cases were examined, with 46 newly identified cases (45 drug-sensitive TB cases and 1 drug-resistant TB case), and 54 patients receiving treatment, including cases detected at the health center and referrals from hospitals. These data indicate an increase in tuberculosis cases from 2023 to 2024.

Therefore, research and health education are necessary to increase community understanding of tuberculosis and encourage preventive measures to avoid infection (SITB Purbalingga Community Health Center, 2025). According to the Directorate General of Disease Control and Environmental Health (Ditjen P2MPL), public understanding and knowledge about tuberculosis in Indonesia remain relatively low, contributing to the increasing number of TB patients. In addition, behavioral factors also influence the transmission of tuberculosis. For instance, improper habits such as spitting sputum carelessly may expose others to infection because tuberculosis bacteria are present in the sputum. TB patients who do not practice proper cough etiquette and healthy, hygienic lifestyles are more likely to transmit the bacteria to people around them (Pralambang & Setiawan, 2021). Previous research by Putri and Yasa (2023) found that attitudes, knowledge, and behavior significantly affect an individual's or group's health status and play a crucial role in determining the success of disease prevention or mitigation programs such as tuberculosis control. Preventive actions or mitigation efforts are strongly influenced by the knowledge and attitudes of individuals, families, and communities regarding tuberculosis prevention (Armanda et al., 2024).

The Ministry of Health of the Republic of Indonesia has implemented tuberculosis prevention programs through health promotion activities in the form of health education. These programs include counseling delivered through direct communication about tuberculosis as well as the use of mass media such as videos and brochures (Ministry of Health of the Republic of Indonesia, 2021). In providing health education, guidance and practical actions must also be emphasized. Health education regarding tuberculosis prevention is necessary to improve the knowledge level of TB patients and their families. Knowledge and attitudes are important risk factors related to tuberculosis transmission. Therefore, families of TB patients also need to receive health education to improve their understanding of tuberculosis and encourage responsible attitudes toward prevention. Adequate knowledge can also reduce fear and stigma, enabling families to better support TB patients during treatment (Kaka, 2021).

Research conducted by Suhendrik et al. (2022) on the effect of health education on patients' knowledge and attitudes in preventing tuberculosis transmission at Rotinsulu Hospital Bandung found that the Wilcoxon test produced an Asymptotic Significance (2-sided) value of $0.000 < \alpha\ 0.05$. This indicates that the null hypothesis was rejected, demonstrating that health education about tuberculosis significantly influences patients' knowledge in preventing disease transmission (Majid et al., 2024). Unlike previous studies that focused on tuberculosis patients, this research emphasizes education delivered through PowerPoint presentations for families of TB patients. The purpose of this educational approach is to enhance early prevention of tuberculosis transmission at home and within the surrounding environment. Families of TB patients also play a role as treatment supervisors to ensure that patients complete their medication and achieve recovery without spreading the disease. This study introduces a novelty in the form of a structured PowerPoint-based educational approach adapted to the local cultural context of Purbalingga through a community-based strategy.

The goal is to go beyond conventional education methods such as leaflets or lectures and significantly improve in-depth knowledge and preventive behaviors among families of TB patients (Perangin-angin et al., 2025). Based on a preliminary survey conducted on Friday, November 29, 2024, involving 10 families accompanying TB patients for medical check-ups

at the Purbalingga Community Health Center, the results showed that 70% of the families did not yet understand tuberculosis or how to prevent infection from the patient. Meanwhile, 30% of the families were already aware of the disease and its prevention. Most families believed that tuberculosis was a hereditary disease rather than a contagious one. This misconception occurred because health education had been provided to TB patients by nurses at the health center but was not effectively conveyed to their families. Therefore, additional health education is necessary to improve both knowledge and attitudes regarding tuberculosis prevention among families of TB patients. Based on the explanation above, the researcher was motivated to conduct a study entitled "The Effect of PowerPoint-Based Health Education on Improving Knowledge and Attitudes Toward Tuberculosis Transmission Prevention Among Families of Patients at the Purbalingga Community Health Center."

2. Preliminaries or Related Work or Literature Review

Tuberculosis and Its Transmission

Tuberculosis (TB) remains one of the most significant global public health challenges. The disease is caused by Mycobacterium tuberculosis and is primarily transmitted through airborne droplets produced when an infected person coughs, sneezes, or speaks. According to the World Health Organization, TB continues to be among the leading causes of mortality from infectious diseases worldwide. The persistence of TB transmission is closely related not only to biological factors but also to social determinants, including living conditions, public awareness, and access to healthcare services. The transmission of TB frequently occurs within households because family members often have prolonged and close contact with infected individuals. Consequently, family members of TB patients represent a high-risk group for infection. Studies have demonstrated that inadequate understanding of TB transmission mechanisms and prevention practices can significantly increase the risk of infection among household contacts. Therefore, preventive strategies must prioritize improving knowledge and awareness among families of TB patients.

Health Education as a Preventive Strategy

Tuberculosis Health education is widely recognized as a key intervention in disease prevention and health promotion. It refers to systematic educational activities designed to improve individuals' knowledge, attitudes, and behaviors regarding health-related issues. In the context of tuberculosis control, health education aims to provide accurate information about the causes, symptoms, transmission pathways, treatment, and preventive measures of TB. Previous research has shown that health education can significantly enhance individuals' understanding of disease prevention. Educational interventions delivered through various media such as lectures, audiovisual materials, or digital presentations have been shown to improve awareness and encourage healthier behavioral practices. By increasing knowledge and shaping positive attitudes, health education plays a crucial role in reducing the spread of communicable diseases, including tuberculosis.

Knowledge and Attitude in Disease Prevention

Knowledge and attitudes are important determinants of health-related behavior. In the field of public health, knowledge refers to an individual's understanding and awareness of health information, while attitude reflects a person's beliefs, perceptions, and predispositions toward particular health behaviors. Adequate knowledge about tuberculosis can encourage individuals to adopt preventive practices such as proper cough etiquette, maintaining adequate ventilation, and ensuring adherence to treatment regimens. Several behavioral theories highlight the relationship between knowledge, attitudes, and preventive actions. Individuals with higher levels of knowledge tend to develop more positive attitudes toward disease prevention and are more likely to engage in protective behaviors. Conversely, misconceptions about tuberculosis such as the belief that TB is hereditary rather than infectious can hinder prevention efforts and contribute to stigma and delayed treatment.

Previous Studies on Health Education and Tuberculosis Prevention

A number of previous studies have examined the effectiveness of health education in improving TB-related knowledge and attitudes. For instance, Suhendrik et al. (2022) investigated the impact of health education on TB patients' knowledge and attitudes regarding transmission prevention at Rotinsulu Hospital in Bandung. Their findings demonstrated a significant improvement in patients' knowledge following educational interventions, as

confirmed by statistical testing. Similarly, other studies have reported that structured health education programs can significantly enhance awareness of TB prevention practices. Educational interventions delivered through counseling sessions, printed materials, or audiovisual media have been found to improve both knowledge levels and behavioral intentions among TB patients and community members. These studies collectively highlight the importance of educational strategies in strengthening tuberculosis prevention programs. However, most previous research has primarily focused on tuberculosis patients themselves, rather than on family members who live in close contact with the patients. While patients receive information during treatment, their families often lack adequate knowledge about preventive measures. This gap may lead to continued transmission within households.

Research Gap and Contribution of the Present Study

Despite the growing body of research on tuberculosis education, limited studies have specifically investigated the impact of health education on families of TB patients, particularly in community health center settings. Family members play an essential role in supporting treatment adherence and implementing preventive practices within the household. Therefore, improving their knowledge and attitudes is critical for reducing the risk of transmission. In addition, many previous studies have relied on conventional educational methods such as lectures or printed leaflets. The present study introduces a structured health education intervention using PowerPoint-based presentations, which provide a more systematic and visually engaging learning approach. This method allows information to be delivered more clearly and effectively, potentially improving participants' comprehension and retention of TB-related knowledge. Thus, this study contributes to the existing literature by focusing on the effect of health education on the knowledge and attitudes of families of TB patients at the Purbalingga Community Health Center. By targeting family members as key actors in household-level prevention, this research aims to strengthen community-based tuberculosis control efforts and provide empirical evidence for the effectiveness of educational interventions in improving TB prevention behavior.

3. Materials and Method

This study employed a quantitative research approach using a pre-experimental design with a one-group pre-test–post-test design as the research framework. Although the one-group pre-test–post-test design has inherent limitations related to internal validity, it is considered appropriate for this study, which focuses on a preliminary investigation and is constrained by the limited number of available samples. Therefore, this design was deemed efficient for evaluating the impact of the intervention under such conditions. The population of this study consisted of all families of tuberculosis patients at the Purbalingga Community Health Center, totaling 54 patients. The sample included 48 families of tuberculosis patients, selected using a purposive sampling technique. Families of tuberculosis patients were identified as respondents based on data obtained from the Purbalingga Community Health Center. Sampling bias was minimized through purposive sampling, in which the researcher selected respondents according to predefined inclusion and exclusion criteria.

The inclusion criteria were families of tuberculosis patients at the Purbalingga Community Health Center who were willing to participate as respondents, who accompanied the patients during medical examinations and had direct contact with them, who lived in the same household as the tuberculosis patient, and who were related to the patient as a child, parent, spouse, or sibling. The exclusion criteria included families of tuberculosis patients who were illiterate, those with a history of tuberculosis, and those who did not participate in the research process completely. Respondents completed both pre-test and post-test questionnaires by marking a checklist for each item on the questionnaire sheet. The questionnaires were completed using a self-administered method, meaning that respondents filled them out independently without direct assistance from the researcher. However, the researcher remained present to accompany the respondents in case clarification was needed. Prior to completing the questionnaire, respondents were asked to provide informed consent. The health education intervention was delivered after the pre-test questionnaire had been completed.

The intervention lasted 30 minutes and was conducted in one session, using PowerPoint as the educational medium. The material presented included the definition of tuberculosis, causes of tuberculosis, modes of transmission, signs and symptoms, prevention methods, and tuberculosis treatment. In this study, health education served as the independent variable, while knowledge and attitudes were the dependent variables. The research instruments consisted of a knowledge questionnaire on tuberculosis and an attitude questionnaire on tuberculosis transmission prevention. The knowledge questionnaire contained 24 items, while the attitude questionnaire consisted of 15 items. These instruments had previously undergone validity and reliability testing, and the results indicated that they were both valid and reliable. The knowledge questionnaire was categorized into three levels: poor knowledge (score 0–8), moderate knowledge (score 9–16), and good knowledge (score 17–24). Meanwhile, the attitude questionnaire was categorized into two levels: negative attitude (total score 15–37) and positive attitude (total score 38–60). Data analysis in this study involved both univariate and bivariate analysis. The Shapiro–Wilk test was used to assess the normality of the data, while the paired sample t-test was employed to analyze the differences between pre-test and post-test results. Ethical clearance for this research was obtained from the Health Research Ethics Committee of Universitas Harapan Bangsa with approval number B.LPPM-UHB/375/04/2025.

4. Results and Discussion

This study was conducted at the Purbalingga Community Health Center with 48 families of tuberculosis patients as respondents. Data collection was carried out over two days, May 23–24, 2025, and the results are as follows:

Characteristics of Respondents Based on Gender, Age, Relationship with the Patient, and Latest Education Level in TB Patient Families at the Purbalingga Community Health Center

Table 1. Characteristics of respondents based on gender, age, relationship with the patient, and latest education level in TB patient families at the Purbalingga Community Health Center.

Respondent Characteristics	f	%
Gender		
Male	10	20.8
Female	38	79.2
Total	48	100
Age		
17–25 years	1	2.1
26–35 years	4	8.3
36–45 years	14	29.2
46–55 years	19	39.6
56–65 years	7	14.6
Above 65 years	3	6.2
Total	48	100
Relationship with the Patient		
Child	11	22.9
Parent	9	18.8
Husband/Wife	10	20.8
Sibling	18	37.5
Total	48	100
Educational Level		
Elementary School	5	10.4
Junior High School	12	25.0
Senior High School / Vocational School	27	56.3

Higher Education	4	8.3
Total	48	100

Source: Primary Data (2025)

Table 1 shows that the majority of family members of TB patients were female, accounting for 38 respondents (79.2%). Most respondents were in the age group of 46–55 years, totaling 19 respondents (39.6%). In terms of relationship with the patient, the largest proportion were siblings, with 18 respondents (37.5%). Regarding educational background, the majority had completed Senior High School/Vocational High School (SHS/VHS), totaling 27 respondents (56.3%). Based on the results of this study, the number of male family members of TB patients was lower than that of females. The study conducted by Khadijah et al. (2023) supports these findings, indicating that females are more frequently represented because they are more likely to report disease symptoms and seek medical consultation. Furthermore, women tend to experience tuberculosis more frequently because many of them are passive smokers. Passive smokers have a greater risk of developing diseases compared to active smokers (Yuniyarti et al., 2025).

The findings of this study also indicate that the predominance of female respondents contributes to a more proactive effort in improving knowledge and modifying attitudes related to tuberculosis prevention within the household. Women are generally more capable of managing stress, communicating effectively, multitasking, and receiving health education materials compared to men. Women also tend to possess stronger communication skills, which facilitate their ability to understand and apply health-related information. In addition, women are often characterized as patient and attentive, enabling them to be more open and receptive to health information (Betrilia et al., 2024). In this study, the age group of 46–55 years falls into the category of early elderly. The findings are consistent with the research of Hutama et al. (2019), which reported that tuberculosis cases are most prevalent among individuals aged 46–55 years.

This may occur because individuals in this age group remain highly productive, which increases their risk of developing pulmonary TB by approximately five to six times. Moreover, individuals in the productive age group tend to engage in higher levels of daily activities, which increases their likelihood of exposure to Mycobacterium tuberculosis. Such exposure may occur due to environmental risk factors, including dust and workplace pollution, as well as frequent interactions with other people, which increase the probability of TB infection (Sari et al., 2023). The age range of 46–55 years belongs to the productive age group, which facilitates individuals' ability to absorb information during educational interventions and makes them more open to attitude changes. Age is often considered an indicator of an individual's level of maturity, including physical, cognitive, and social maturity. As individuals grow older, their capacity to understand and process information tends to improve. Consequently, the knowledge they acquire becomes more comprehensive. In everyday life, an individual's level of knowledge is influenced by personal experiences as well as by a sufficiently mature age. Therefore, it can be concluded that most respondents in this study possessed an adequate level of maturity in decision-making and critical thinking. As a result, the educational intervention delivered by the researchers could be optimally understood by the participants (Afifah et al., 2023).

The recovery of tuberculosis patients strongly depends on family support. The individuals closest to patients are typically their family members. In this study, siblings constituted the largest group of respondents and often play significant roles as informal caregivers at home, providers of emotional support, and key decision-makers regarding patient care. The close relationship between siblings and patients may influence how they respond to the patient's illness, including their levels of stress, anxiety, and the type of support they provide. Therefore, adequate knowledge and positive attitudes are essential in supervising and supporting tuberculosis patients. Such understanding also enables family members to remind patients to consistently apply tuberculosis transmission prevention measures while protecting themselves from potential infection (Reasioanto et al., 2023).

The findings also indicate that the educational level of respondents was predominantly Senior High School/Vocational High School, which falls within the category of secondary

education. Education represents a structured effort aimed at enabling individuals or communities to acquire knowledge and skills through the learning process. Individuals with higher educational attainment tend to seek healthcare services more frequently when they or their family members experience illness. Higher educational levels are generally associated with greater awareness of the importance of health for overall well-being. Consequently, individuals with higher education are more motivated to access the best available healthcare facilities. Moreover, education facilitates easier access to information and contributes to the improvement of an individual's knowledge (Absor, 2020).

Level of Knowledge of TB Patients' Families About Tuberculosis Before Health Education at the Purbalingga Community Health Center

Table 2. Frequency distribution of the level of knowledge of TB patients' families about tuberculosis before health education at the Purbalingga Community Health Center

Category	*f*	%
Less	2	4.2
Moderate	31	64.6
Good	15	31.2
Total	**48**	**100**

Source: Primary Data (2025)

Table 2 shows that the majority of TB patients' family members had a moderate level of knowledge prior to receiving health education, with 31 respondents (64.6%). Meanwhile, the smallest proportion fell into the low knowledge category, comprising 2 respondents (4.2%). In this study, the level of knowledge among family members of tuberculosis patients before the provision of health education was generally categorized as moderate. Therefore, health education is necessary to further improve their level of knowledge so that they can better understand methods for preventing tuberculosis transmission and encourage supportive behaviors toward tuberculosis patients. Knowledge itself is obtained through the process by which humans perceive something using their senses, enabling individuals to recognize and understand objects or phenomena. The high incidence of tuberculosis is partly attributed to the limited knowledge among family members of TB patients regarding transmission prevention. Low educational attainment may affect the level of knowledge among TB patients' families concerning the prevention of tuberculosis transmission, which in turn results in respondents being less able to optimally apply the information provided by health professionals (Dewi & Dafriani, 2021).

The findings of this study are consistent with the results reported by Zega (2024), which indicate that many family members of TB patients still do not fully understand how tuberculosis can be transmitted to others. Prior to receiving health education, some family members of TB patients were not aware that tuberculosis can spread through droplets produced when coughing or speaking, through saliva that is disposed of carelessly, and due to limited information regarding the prevention of tuberculosis transmission. The knowledge of TB patients' family members may also be influenced by other predisposing factors such as educational background. Individuals with higher levels of education tend to access information more quickly, which in turn contributes to improved knowledge. In addition, an individual's knowledge can also be influenced by age. As age increases, the level of curiosity tends to grow, and individuals generally become more capable of understanding information.

Attitudes of TB Patients' Families Regarding Tuberculosis Transmission Prevention Before Health Education at the Purbalingga Community Health Center

Table 3. Frequency distribution of attitudes of TB patients' families regarding tuberculosis transmission prevention before health education at the Purbalingga Community Health Center.

Category	*f*	%
Negative	32	66.7
Positive	16	33.3
Total	**48**	**100**

Source: Primary Data (2025)

Table 3 shows that the majority of TB patients' family members had negative attitudes prior to receiving health education, with 32 respondents (66.7%). Meanwhile, a smaller proportion demonstrated positive attitudes, comprising 16 respondents (33.3%). The results of this study indicate that the attitudes of family members of tuberculosis patients before receiving health education were predominantly categorized as negative. This condition is largely attributed to the lack of information and understanding among family members regarding the prevention of tuberculosis transmission. Therefore, a stimulus for change is required, such as the provision of health education. Through health education, it is expected that the attitudes of TB patients' family members will improve (Ndoa, 2025).

Attitude refers to a still latent or closed response or reaction of an individual toward an object or stimulus. From these definitions, it can be concluded that the manifestations of attitude are not directly observable; rather, they are first interpreted through covert behaviors. In reality, attitudes reflect the connotation of an appropriate reaction to certain stimuli encountered in daily life, particularly emotional reactions to social stimuli. Attitudes do not constitute activities or actions themselves, but rather represent a tendency or predisposition to perform certain behaviors (Pakpahan, 2021). According to Putri (2021), the greater the life experiences acquired by an individual, the more those experiences influence the person's attitudes. Conversely, when an individual lacks experience, negative attitudes are more likely to develop. Similarly, the findings of this study indicate that many respondents still exhibited negative attitudes because health education regarding the prevention of tuberculosis transmission had not yet been provided to them.

Level of Knowledge of TB Patients' Families About Tuberculosis After Health Education at the Purbalingga Community Health Center

Table 4. Frequency distribution of the level of knowledge of TB patients' families about tuberculosis after health education at the Purbalingga Community Health Center.

Category	*f*	%
Low	0	0
Moderate	13	27.1
Good	35	72.9
Total	**48**	**100**

Source: Primary Data (2025)

Table 4 shows that the majority of TB patients' family members had a good level of knowledge after receiving health education, with 35 respondents (72.9%), while none of the respondents fell into the low knowledge category, with 0 respondents (0%). After counseling on the prevention of tuberculosis transmission was provided, respondents were able to receive and understand the information presented in the educational materials, resulting in an improvement in their level of knowledge. Once information regarding the prevention of tuberculosis transmission was obtained, the results demonstrated an increase in the knowledge level of TB patients' family members (Zega, 2024). When knowledge about the dangers of tuberculosis is low, the potential sources of transmission, both within households and in the wider community, become greater.

Conversely, when individuals possess adequate knowledge, they are more likely to avoid infection and are better able to protect themselves as well as the surrounding community. Following the provision of health education, respondents' knowledge regarding the prevention of tuberculosis transmission increased, which consequently led to changes in their preventive behaviors against tuberculosis transmission (Akbar, 2021). The study conducted by Faidah (2024) supports the findings of this research. After health education on tuberculosis transmission prevention was provided at the Randublatung Community Health Center in Blora, the results showed that 24 respondents (72.7%) were categorized as having a good level of knowledge, while 9 respondents (27.3%) were categorized as having a moderate level of knowledge. This finding indicates that the information received by family members of TB patients regarding tuberculosis prevention significantly enhances their understanding.

Attitudes of TB Patients' Families Regarding the Prevention of Tuberculosis Transmission After Health Education at the Purbalingga Community Health Center

Table 5. Frequency distribution of attitudes of TB patients' families regarding the prevention of tuberculosis transmission after health education at the Purbalingga Community Health Center.

Category	*f*	%
Negative	2	4.2
Positive	46	95.8
Total	**48**	**100**

Source: Primary Data (2025)

Table 5 shows that the majority of TB patients' family members demonstrated positive attitudes after receiving health education, totaling 46 respondents (95.8%), while only a small proportion remained in the negative attitude category, comprising 2 respondents (4.2%). The results of this study indicate that health education can change the attitudes of family members, making them more concerned and supportive toward tuberculosis patients. This intervention successfully transformed family stigma from fear of infection into a more proactive approach in taking preventive actions. In addition, family members also became involved as medication adherence supervisors and as agents in preventing the transmission of tuberculosis (Marissa et al., 2024).

The improvement in attitudes observed in this study was influenced by several factors, including the provision of health education interventions by the researcher. Through this intervention, respondents gained knowledge regarding tuberculosis prevention, including the use of masks. Before respondents completed the posttest questionnaire, health education was first provided, allowing the results to be observed immediately by comparing the outcomes of the pretest and posttest questionnaires. This approach aimed to determine the improvement in attitudes as well as to evaluate the effectiveness of the health education provided. Other contributing factors include the use of effective health education media as a means of delivering messages and information (Putri, 2021).

The study conducted by Pramesti (2022) supports the findings of this research. After health education on transmission prevention was provided at the Telaga Dewa Community Health Center, the attitudes of heads of households also increased compared to the period before the educational media (Lembasis) was provided. The average score increased from 27.11 before the intervention to 52.89 after the intervention. This indicates that the information received by respondents significantly improves attitudes toward the prevention of tuberculosis transmission.

The Effect of Health Education on Tuberculosis on the Level of Knowledge and Attitudes Towards Preventing the Transmission of Tuberculosis in the Families of TB Patients at the Purbalingga Community Health Center

Table 6. The effect of health education on tuberculosis on the level of knowledge and attitudes towards preventing the transmission of tuberculosis in the families of TB patients at the Purbalingga Community Health Center.

Variable	Before (Mean)	Percentage (%)	SD	After (Mean)	Percentage (%)	SD	p-value
Knowledge	14.46	68.8	3.626	18.75	78.1	2.899	0.000
Attitude	34.77	75.5	5.721	49.94	84.6	5.448	0.000

Source: Primary Data (2025)

Table 6 shows that the average score of knowledge before the provision of health education was 14.46 (68.8%), while after the health education intervention it increased to 18.71 (77.9%). Meanwhile, the average attitude score before the provision of health education was 34.98 (76%), which increased to 49.94 (84.6%) after the intervention. The bivariate analysis conducted using the paired sample t-test (Paired Sample T-Test) produced a p-value of $0.000 < 0.05$. Therefore, H_0 was rejected and H_a was accepted, indicating that health education regarding tuberculosis has a significant effect on the knowledge and attitudes related to the prevention of tuberculosis transmission among the families of TB patients at the Purbalingga Community Health Center. These findings indicate that the knowledge and attitudes of family members of tuberculosis patients before and after the provision of health

education differ significantly and demonstrate a noticeable improvement. One of the factors influencing this improvement is the level of education.

The higher an individual's level of education, the greater their capacity to comprehend and absorb various forms of information. These findings also confirm that structured health education successfully enhances understanding and preventive behaviors related to tuberculosis transmission among patients' families. Scientifically, this change demonstrates that increased knowledge directly encourages improvements in attitudes and preventive behaviors (Riansyah et al., 2025). The study conducted by Susanto (2023) supports the results of this research, indicating that health education about tuberculosis provides strong evidence of a positive influence in improving knowledge. Respondents' knowledge increased significantly in the experimental group, with the average pretest score rising from 50.48 to 77.14 in the posttest.

This finding demonstrates the effectiveness of health education in improving respondents' understanding of tuberculosis-related material. One method of delivering information about the prevention of tuberculosis transmission is through educational sessions using the lecture method. The average scores of knowledge and attitudes can increase through health counseling or health education. Positive behaviors regarding the prevention of tuberculosis transmission can be developed through continuous educational efforts (Majid et al., 2024). Health education is a learning program designed to help communities better understand the causes, signs, and symptoms of tuberculosis, as well as methods for preventing its transmission and maintaining good health practices. Families of TB patients who are encouraged through health education programs are more likely to undergo health examinations, receive regular educational information, and improve their understanding of how to prevent tuberculosis transmission, such as by participating in educational programs and providing support to family members affected by tuberculosis (Ivana & Permata, 2023).

Health education or counseling plays a significant role in preventing the transmission of tuberculosis, as demonstrated by the comparison between the pretest and posttest results. Before the educational intervention, many respondents were unaware that tuberculosis could be transmitted through actions such as not wearing a mask while coughing or sneezing, through droplets of saliva, or by spitting indiscriminately, which can become a source of infection for others. After the educational intervention, individuals' knowledge and attitudes regarding methods for preventing tuberculosis transmission improved, enabling them to understand that preventive measures include wearing masks when coughing or sneezing and avoiding spitting in public places (Zega, 2024).

This study still has several limitations and shortcomings. One of the limitations is that the family members of tuberculosis patients who attended were mostly extended relatives. These relatives included aunts or other extended family members rather than the patients' children, parents, or spouses, mainly because the latter were often unable to attend due to work commitments. As a result, many of the participating family members did not live in the same household as the tuberculosis patients. Additionally, this study did not include a post-intervention follow-up to evaluate whether the observed improvements in knowledge and attitudes could be sustained over time, despite the significant increases observed during the intervention period.

5. Conclusion

The characteristics of the 48 respondents show that most of the families of tuberculosis patients are female (79.2%), aged 46–55 years (39.6%), related to the patient as a sibling (37.5%), and the majority of their last education level is high school/vocational high school (56.3%). The level of knowledge of tuberculosis patients' families before health education was in the sufficient category (64.6%), and after health education, it was in the good category (72.9%). The attitude of tuberculosis patients' families before health education was in the negative category (66.7%), and after health education, it was in the positive category (95.8%). There were significant results with a p-value of $0.000 < 0.05$, indicating that PowerPoint-based health education had an effect on improving knowledge and attitudes toward preventing tuberculosis transmission among families of patients at the Purbalingga Community Health Center.

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