



Education on the Prevention and Early Detection of Pulmonary Tuberculosis Through Anamnestic Screening

Bastiana Bermawi^{1*}, Diyan Wahyu Kurniasari¹, Prihatini¹, Ghezali Tristan Aqmal¹, Nurul Hidayatih², Firlana Dania Az-Zahra¹

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ABSTRACT

Pulmonary Tuberculosis remains a major public health problem in Indonesia. The elderly are a vulnerable group due to decreased immunity and comorbidities, while stigma and low awareness often hinder early detection. This Community Service activity aimed to improve elderly understanding of Pulmonary Tuberculosis prevention and early detection through interactive education and anamnestic screening. The innovation of this program lies in the use of the N-Gain Score to evaluate the effectiveness of health education at the community level. The activity involved health education through interactive lectures, discussions, and educational media (PowerPoint and booklet), followed by anamnestic screening using a structured questionnaire. A total of 29 elderly participants from Wonocolo District were included as a high-risk group. Effectiveness was assessed using pre-tests and post-tests with 10 multiple-choice questions, analyzed using the N-Gain Score. Results showed an increase in the average knowledge score from 70.34 to 94.48 (gain of 24.14 points). Fourteen participants achieved a high N-Gain category, 13 were moderate, and none were low. No Pulmonary Tuberculosis symptoms were detected during screening. This program effectively improved health literacy and awareness among the elderly. Supporting community-based efforts toward Pulmonary Tuberculosis elimination.

Keywords: Pulmonary Tuberculosis; Health Education; Elderly; N-Gain Score; Wonocolo

INTRODUCTION

The Wonocolo District in Surabaya is a densely populated area that faces various public health challenges, one of which is Pulmonary Tuberculosis. The elderly population represents a vulnerable group due to decreased immune function and the presence of comorbidities. Moreover, stigma toward tuberculosis patients and the community's limited knowledge often lead to delays in case detection. These conditions highlight the need for interventions such as health education and anamnestic screening as initial steps for early detection and as part of community-based efforts to control tuberculosis cases.

Globally, tuberculosis (TB) remains a major public health concern. The World Health Organization (WHO, 2023) reported that in 2022, there were approximately 10.6 million new TB cases worldwide, with Indonesia ranking among the top three countries with the highest TB burden, alongside India and China. The global TB mortality rate reached 1.3 million deaths. In Indonesia, the prevalence of TB was 354 per 100,000 population, with an estimated incidence of around 969,000 cases per year (Kementerian Kesehatan RI, 2023). Indonesia accounts for

¹ Faculty of Medicine, Nahdlatul Ulama University

² Research and Community Service Unit, Faculty of Medicine, Nahdlatul Ulama University

**) corresponding author*

Bastiana Bermawi
Email: dr.bastiana@unusa.ac.id

approximately 10% of global TB cases, together with India, China, the Philippines, and Pakistan. In the Southeast Asia Region, about 45% of global TB cases occur, placing Indonesia as the country with the second-highest number of pulmonary TB cases. The city of Surabaya also contributes significantly, with 10,741 TB cases recorded by the end of November 2024, representing 73.89% of the annual case detection target (Dinas Kesehatan Jawa Timur, 2024).

This issue is further compounded by the limited public knowledge concerning the transmission, symptoms, and prevention of TB. A study conducted in Surabaya revealed that only 8% of respondents correctly understood the mode of TB transmission, while the majority remained influenced by myths and stigma (Dinas Kesehatan Surabaya, 2024). Although specific data on TB prevalence among the elderly population are limited, preliminary surveys conducted by the community service team indicated substantial knowledge gaps and persistent misconceptions within this group. Therefore, community-based educational interventions are considered an essential strategy to enhance public awareness and promote the early detection of TB cases.

The community empowerment approach has been proven effective in TB control programs. A scoping review reported that trained community health workers play a crucial role in improving case detection, supporting treatment adherence, and reducing stigma, although barriers such as limited access to diagnostic facilities persist. This approach positions communities not merely as recipients of information but as active agents capable of identifying problems, setting priorities, and taking concrete actions in disease prevention. The World Health Organization (WHO) defines community empowerment as the process of enabling people to gain greater control over the factors that influence their health. Various community-based educational interventions, including counseling sessions incorporating demonstrations and role-play, have been shown to effectively improve public understanding of TB from recognizing symptoms to implementing preventive measures through collaboration among academic institutions, government bodies, non-governmental organizations (NGOs), and local communities.

Based on this background, this community service program aimed to enhance public understanding particularly among the elderly population in the Wonocolo District regarding the prevention and early detection of pulmonary TB. The educational intervention was implemented through interactive counseling sessions supported by visual and printed media, including PowerPoint presentations and informational booklets. Early detection efforts were conducted through anamnesis-based screening using a structured questionnaire. This program is expected to increase community knowledge and awareness of TB, improve referrals of suspected cases to healthcare facilities, and foster active community participation in supporting the national TB elimination program.

LITERATURE OR CONCEPTUAL REVIEW

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis*, which primarily affects the lungs but can also involve other organs. Transmission occurs through airborne droplets released when individuals with active TB cough or sneeze. The main risk factors include weakened immune status, poor nutritional condition, high population density, and the presence of comorbid diseases such as diabetes mellitus and HIV/AIDS (WHO, 2023; Kemenkes RI, 2023). Among the elderly population, susceptibility to TB infection increases due to the aging process, which leads to a decline in immune system function (immunosenescence). Consequently, early detection becomes a critical challenge in TB control within this population.

Health education is a process aimed at improving community knowledge, attitudes, and behaviors in disease prevention through the delivery of accurate and relevant information. In the context of tuberculosis (TB), health education plays a crucial role in reducing stigma, increasing awareness of early symptoms, and promoting timely health-seeking behavior (Qomariyah et al., 2024). Interactive educational approaches, such as participatory lectures, group discussions, and the use of visual media such as booklets or presentation slides, have been shown to be more effective than passive methods,

as they allow participants to develop a deeper understanding of concepts and foster active learning experiences.

Anamnesis-based screening is an initial method for identifying individuals at risk of, or exhibiting symptoms of, tuberculosis (TB) through a structured interview. This approach is considered efficient in community settings, particularly in resource-limited areas, as it enables the identification of suspected TB cases prior to further diagnostic examination (Telisinghe et al., 2021; MacPherson et al., 2024). In addition, anamnesis-based screening helps increase individuals' awareness of their own health status and can serve as an entry point for further medical referral when suspicious symptoms are identified (Madona et al., 2023).

Community empowerment is a key strategy in tuberculosis (TB) elimination programs that positions the community as the main actor in disease prevention and control efforts. A scoping review study indicated that the involvement of health cadres and community leaders in educational activities can enhance case detection, strengthen social support for patients, and reduce stigma (Siregar et al., 2022). The World Health Organization (WHO) also emphasizes that the success of TB control relies on the active involvement of communities in recognizing risk factors and participating in promotive and preventive activities.

The effectiveness of the educational intervention was assessed using the N-Gain Score method, which enables the analysis of participants' knowledge improvement before and after the intervention. The N-Gain values were classified as high (>0.7), moderate ($0.3-0.7$), and low (<0.3), according to Hake (1999). This method has been widely applied in health education research to evaluate the extent to which educational interventions impact participants' understanding. In the context of this activity, the N-Gain Score analysis provides quantitative evidence of the effectiveness of interactive educational approaches at the community level among the elderly population.

MATERIALS AND METHODS

The community service activity employed a health education method combined with lectures and interactive discussions during Q&A sessions to enhance public knowledge, particularly among the elderly group, regarding the prevention and early detection of pulmonary tuberculosis (TB). The activity was conducted at the Wonocolo District Hall, Surabaya, on July 3, 2025, an area selected due to its high population density and proximity to Nahdlatul Ulama University of Surabaya (UNUSA), which facilitated team mobilization.

The target participants were 29 elderly individuals, chosen because they represent a vulnerable group to TB infection owing to immune system decline and potential comorbidities. The activity began with an opening and program introduction, followed by an educational session covering the definition of pulmonary TB, modes of transmission, risk factors, signs and symptoms, preventive measures, and the importance of early detection through health facility visits.

The educational materials were delivered using PowerPoint presentations and educational booklets, written in simple and accessible language to ensure understanding. After the health education session, anamnesis-based screening was conducted using a structured questionnaire to identify participants at high risk of pulmonary TB. Subsequently, participants took part in interactive discussions that provided opportunities to ask questions and clarify misconceptions about TB, including traditional treatment myths often mistaken as primary therapy.

To evaluate the effectiveness of the intervention, knowledge assessments were carried out through pre-test and post-test questionnaires consisting of ten multiple-choice questions covering TB-related concepts, risk factors, transmission, symptoms, and prevention. The collected data were analyzed by comparing the average pre-test and post-test scores. The primary outcome measured was the improvement in participants' TB-related knowledge, which was further analyzed using the N-Gain Score method to determine individual knowledge gains and assess community acceptance of anamnesis-based screening as a community-level early detection effort.

RESULTS AND DISCUSSION

The community service activity on the prevention and early detection of Pulmonary Tuberculosis (TB) in Wonocolo District, Surabaya, was conducted to enhance public knowledge and awareness, particularly in correcting misconceptions and providing accurate information regarding the symptoms, transmission, and prevention of TB. This activity was attended by 29 elderly participants who received health education through an interactive counseling session supported by educational media, including PowerPoint presentations and informational booklets.

Table 1. Distribution of Respondents by Age

Age Category	Respondents (n)
45-59 years	8
60-69 years	9
70-79 years	9
≥80 years	3

Based on Table 1, most of the participants were elderly individuals. The age groups of 60–69 years and 70–79 years each comprised 9 respondents, with a total of 18 participants across these two categories. Meanwhile, only 3 respondents were aged above 80 years, indicating that participation from the very elderly group was lower. This analysis shows that the program successfully reached the older adult population. To measure the effectiveness of the intervention, knowledge evaluation was carried out using pre-test and post-test assessments consisting of 10 multiple-choice questions. The results were then analyzed using the N-Gain Score to determine the improvement in knowledge and the effectiveness of the health education method used. Table 2 presents the mean scores of the participants' pre-test and post-test results.

Table 2. Mean Pre-test and Post-test Scores on Pulmonary Tuberculosis Knowledge among Elderly Participants in Wonocolo District (n = 29)

	Mean	Min	Max
Pre-test	70.34	30	70
Post-test	90.48	90	100

Based on the analysis of the mean pre-test and post-test scores of the 29 participants, there was a significant improvement in knowledge. The average pre-test score of 70.34 increased to 94.48 in the post-test, with a mean difference of 24.14 points. This indicates the effectiveness of the health education intervention in enhancing participants' understanding of the provided material. The distribution of individual pre-test and post-test scores is presented in Figure 1, which illustrates a consistent upward trend in participants' scores.

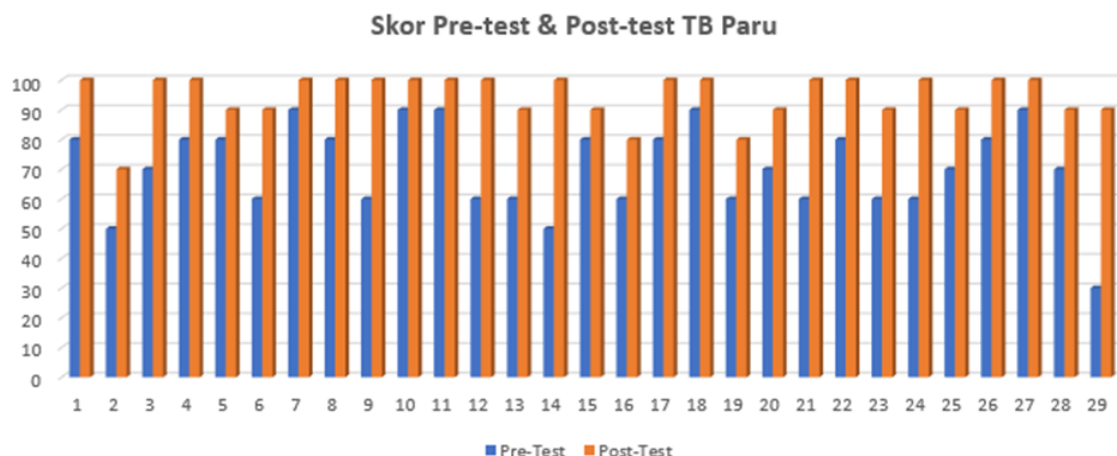


Figure 1. Distribution of Individual Pre-test and Post-test Scores among Participants of the Pulmonary Tuberculosis Health Education Program in Wonocolo District (n = 29)

From the bar chart “*Pre-test and Post-test Scores on Pulmonary Tuberculosis*”, it can be observed that 17 participants achieved a perfect score of 100 in the post-test. This indicates that more than half of the participants were able to fully comprehend the material after the educational intervention. Overall, nearly all participants demonstrated an increase in their scores compared to the pre-test, with the mean post-test score being substantially higher. Figure 2 will present the distribution of N-Gain Scores to further illustrate the effectiveness of the educational method applied to each participant.

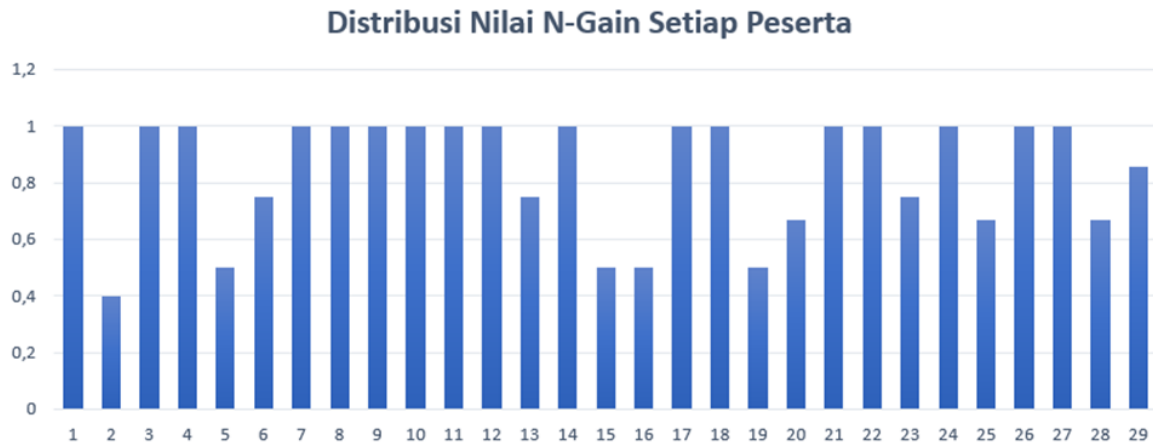


Figure 2. Distribution of N-Gain Scores among Participants of the Pulmonary Tuberculosis Health Education Program in Wonocolo District (n = 29)

Based on the bar chart “Distribution of N-Gain Scores Among Participants,” there is a noticeable variation in the improvement of participants’ knowledge following the pulmonary tuberculosis education session. Referring to Hake’s criteria (1999), the N-Gain categories are divided into three levels: low (<0.3), medium ($0.3–0.7$), and high ($>0.7–1.0$). A total of 18 participants achieved N-Gain scores between 0.7 and 1.0, namely participants numbered 1, 3, 4, 7, 8, 9, 10, 11, 12, 14, 17, 18, 21, 22, 24, 26, 27, and 29. Meanwhile, 11 participants obtained scores ranging from 0.3 to 0.7, specifically participants numbered 2, 5, 6, 13, 15, 16, 19, 20, 23, 25, and 28. No participants were categorized as low (<0.3). Overall, these results indicate that the majority of participants fall within the high and medium categories, demonstrating that the pulmonary tuberculosis education intervention significantly improved participants’ understanding. This notable success cannot be separated from the approach implemented by the team. The combination of interactive delivery methods such as active discussion, engaging visual media (PowerPoint slides and educational booklets), and direct demonstrations of proper cough etiquette proved highly effective for elderly participants.

DISCUSSION

The bar chart results indicate that the majority of participants fell into the moderate ($0.3–0.7$) and high (≥ 0.7) N-Gain categories, with 14 participants achieving a perfect N-Gain score (1.0). This pattern demonstrates the high effectiveness of the pulmonary tuberculosis education program in successfully transferring knowledge. Theoretically, Hake (1999) states that a high N-Gain value reflects meaningful learning, in which new knowledge is constructed upon existing understanding. In addition, constructivist learning theory emphasizes that participants who actively engage in learning (through discussion, question-and-answer sessions, and reflection) tend to achieve greater improvements in knowledge. The high N-Gain outcomes suggest that the teaching methods used such as presentations, discussions, visual aids, and demonstrations of proper cough etiquette were sufficiently interactive and aligned with active learning principles, which have been proven to enhance retention and comprehension in health education contexts (Waluyo et al., 2024).

In addition to the educational intervention, this program also included anamnesis-based screening using a structured questionnaire to identify individuals at high risk. All 29 participants who attended the activity underwent the anamnesis screening process. Based on the screening results, no participants showed symptoms or clinical indications suggestive of Pulmonary Tuberculosis (TB). Although no suspected cases were identified, this finding remains significant. It indicates that the prevalence of TB-related symptoms in the participant group was low. This data may serve as a reference for the local Public Health Center (Puskesmas) to continue prioritizing prevention efforts in the area, while the educational program implemented may function as a preventive measure to maintain the community's health status.

Tuberculosis (TB) education is not only important for the general population but is particularly crucial among older adults. The elderly are at a higher risk of acquiring new TB infections or experiencing reactivation of latent infections, and they often have poorer treatment outcomes due to delayed diagnosis and increased susceptibility to adverse drug reactions. A study conducted in China (2025) reported that only approximately 28.5% of migrant older adults had been exposed to TB education within the past year, while social participation was shown to increase the likelihood of receiving TB education by around 10% (Liu et al., 2025; Negin et al., 2015). Furthermore, improvements in health literacy through educational interventions have been shown to enhance self-management ability, increase comprehension of health-related information, and support treatment adherence, an aspect particularly relevant among older adults who often exhibit low levels of health literacy (Chauhan et al., 2024).

A number of studies support the finding that educational interventions play a significant role in improving knowledge and preventive behavior related to pulmonary tuberculosis. Research conducted in Sindang Jaya Village demonstrated that health education significantly increased public knowledge about pulmonary TB ($p < 0.001$) (Wati et al., 2023). Educational media such as leaflets and animated videos have also been shown to be effective in enhancing knowledge, both in the general population and among older adults (Indriani & Muis, 2022; Arsyad et al., 2021). In addition, the literature on health literacy emphasizes that improving health literacy is essential in bridging socio-economic gaps and improving health outcomes in TB patients, particularly in terms of treatment adherence and comprehension of health information (Yadav et al., 2023).

Although the educational intervention yielded encouraging results, several minor challenges were encountered during implementation. The primary barrier involved the mobilization time of elderly participants, which caused the event schedule to be slightly delayed from the initial plan. However, this issue was successfully managed through the team's flexibility in adjusting time allocation and effective coordination with local volunteers to assist participants in arriving comfortably at the venue. This situation provided an important lesson on the need for adaptive logistical planning, particularly when working with vulnerable target groups. Nonetheless, this challenge did not affect the quality of material delivery, and the entire program was completed optimally. Several areas for improvement remain noteworthy. First, strategies to reach elderly individuals especially those with limited exposure to health education need to be strengthened, for instance through community-based approaches, elderly health posts (*posyandu lansia*), and traditional local media such as mobile health clinics or community newspapers. Second, the use of visual media such as animated educational videos and leaflets may enhance comprehension, particularly for older adults with limited literacy skills. Third, long-term evaluation (follow-up) on knowledge retention and the application of healthy behaviors is essential to ensure that the effect of education is not merely short-term. In conclusion, pulmonary TB education has been proven effective in improving participants' knowledge, with outcomes falling within the high and moderate categories. However, expanding the reach of educational programs among the elderly and continuously developing more inclusive and sustainable delivery methods remain important efforts to support future TB prevention and control success. Several documentation records of the community service activities are presented in Figure 3.



Figure 3. (a) Delivery of educational material on pulmonary tuberculosis to older adults at the Wonocolo District Hall; (b) Interactive discussion with the participants.

CONCLUSIONS

The community service activity involving health education and anamnesis-based screening for Pulmonary Tuberculosis (TB) in Wonocolo District, Surabaya, proved effective in improving knowledge among the elderly target group. The average score increased significantly from 70.34 (pre-test) to 94.48 (post-test), with a gain of 24.14 points. In addition, the N-Gain analysis showed that most participants were in the moderate to high categories, with 14 participants achieving a perfect score (1.0), indicating the effectiveness of the interactive educational method.

The screening component, conducted using a structured questionnaire, revealed that none of the 29 participants exhibited symptoms suggestive of TB. Although no presumptive TB cases were identified, this finding highlights the importance of preventive education to maintain low symptom prevalence and encourage early health-seeking behavior.

These results are consistent with constructivist learning theory and previous research demonstrating that community-based educational approaches effectively enhance health literacy, reduce stigma, and support TB prevention efforts. However, sustainable dissemination strategies are needed to reach elderly individuals with limited access or low literacy. Strengthening visual learning media, optimizing elderly community health posts, and conducting long-term follow-up assessments are essential to ensure sustained impact. Overall, this activity contributes to TB elimination efforts and underscores the critical role of community empowerment in infectious disease control at the local level.

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Conflict of Interests

The authors declared that no potential conflicts of interest with respect to the authorship and publication of this article.

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