



Health Education Through The “Lawan TBC” Movement to Improve Tuberculosis Prevention Knowledge in Islamic Boarding Schools

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DOI: <http://doi.org/10.61987/communautaire.v5i1.2022>

Article History:

Received: 06 March 2026

Revised: 19 May 2026

Accepted: 23 May 2026

Keywords:

Tuberculosis Prevention, Health Education, Islamic Boarding Schools

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Abstract:

Tuberculosis (TB) remains a major public health concern in Islamic boarding schools due to the high risk of disease transmission in communal living environments. This study aimed to evaluate the effectiveness of the "Lawan TBC" educational movement in improving students' knowledge of tuberculosis prevention. A pre-experimental one-group pretest–posttest design was conducted among 38 students in grades 10–12 at an Islamic boarding school in Surabaya. The intervention included lectures, interactive discussions, and question-and-answer sessions on TB transmission, symptoms, prevention, and proper cough etiquette. Knowledge was assessed using questionnaires administered before and after the intervention. Data were analyzed using the Wilcoxon Signed-Rank Test. The mean pretest score was 35.53 ± 10.05 , increasing to 46.32 ± 7.86 in the posttest, with a mean difference of 10.79 points. Statistical analysis showed a significant improvement in knowledge after the intervention ($p = 9.45 \times 10^{-8}$; $p < 0.01$). The findings demonstrate that the "Lawan TBC" educational movement effectively improves students' knowledge of tuberculosis prevention. Educational programs in Islamic boarding schools can support TB prevention efforts and promote preventive health behaviors among adolescents.

INTRODUCTION

Tuberculosis (TB) remains one of the most significant infectious diseases worldwide and continues to pose a major public health challenge, particularly in low- and middle-income countries (Rebecca et al., 2022; Xiao et al., 2025). The disease is caused by *Mycobacterium tuberculosis* and spreads through airborne droplets released when infected individuals cough, sneeze, or speak. Despite the availability of effective prevention and treatment strategies, TB remains a leading cause of morbidity and mortality (Trajman et al., 2025; Prihanti et al., 2021). According to the World Health Organization, tuberculosis was responsible for approximately 1.3 million deaths globally in 2023, making it one of the leading causes of death from infectious diseases (WHO, 2023). The persistence of TB transmission is closely associated with inadequate public awareness, delayed diagnosis, overcrowded living conditions, and poor implementation of preventive behaviors. Therefore, strengthening community knowledge regarding TB prevention is an essential strategy to reduce disease transmission and improve public health outcomes (Gurusinga et al., 2024).

Indonesia remains one of the countries with the highest tuberculosis burden worldwide (Haykal et al., 2024; Anandita & Christian, 2026). Although national TB control programs have been implemented, the incidence of new cases remains high, indicating ongoing transmission within communities. One of the major challenges in TB prevention is the limited public knowledge of disease transmission, symptoms, and preventive measures. Limited public access to health information often hinders effective prevention efforts and delays health-seeking behavior (Amalia et al., 2021). If this condition is not addressed, the risk of transmission, morbidity, and mortality may continue to increase (Chen et al., 2023; Dai et al., 2024).

Islamic boarding schools (*pondok pesantren*) represent educational institutions with unique social and environmental characteristics that may increase the risk of infectious disease transmission. Students typically live, study, worship, and interact in shared spaces, creating high-density communal environments (Amalia et al., 2021; El Muna et al., 2024). PP Assalafi Al Fithrah Surabaya is one of the largest Islamic boarding schools in the region, accommodating a large number of students through residential and non-residential educational programs. Considering the high number of TB cases reported in Surabaya, which reached 10,741 cases in 2022 with 1,691 additional cases identified by March 2023 (Widiyana, 2023), tuberculosis prevention in Islamic boarding schools has become an important public health concern.

Previous studies have demonstrated that health education interventions can effectively improve knowledge and awareness regarding tuberculosis prevention. Educational approaches such as lectures, group discussions, and community-based health promotion programs have been shown to increase participants' understanding of TB symptoms, transmission routes, and preventive behaviors (Santoso et al., 2023). Furthermore, studies have shown that increased knowledge is positively associated with healthier behaviors, including proper cough etiquette and early health-seeking behavior (Lutfiah, Melyani, & Kurnia, 2021).

Despite the growing evidence regarding the effectiveness of TB education programs, several gaps remain in the existing literature (Bala, Arora, Chawla, & Gautam, 2021). Most studies have focused on general community populations or conventional school settings. At the same time, limited attention has been given to Islamic boarding schools, which possess distinct environmental and cultural characteristics that may influence disease transmission and health behavior. This gap is important because adolescents represent a strategic target group for health promotion, given their ability to adopt new knowledge and influence peers (Santoso et al., 2023). Therefore, evaluating the effectiveness of the "Lawan TBC" educational movement in an Islamic boarding school setting can provide valuable evidence for developing targeted tuberculosis prevention strategies.

Based on these conditions, the primary problem faced by the community is the limited knowledge of students regarding tuberculosis prevention and appropriate preventive behaviors. Insufficient understanding of TB transmission, symptoms, cough etiquette, and healthy living practices may increase the risk of disease spread within densely populated boarding school environments. Given the high burden of tuberculosis in Surabaya and the vulnerability of communal living settings, effective educational interventions are needed to address this knowledge gap.

This community service activity aimed to evaluate the effectiveness of the "Lawan TBC" educational movement in improving students' knowledge of tuberculosis

prevention at PP Assalafi Al Fithrah Surabaya. Through this initiative, students are expected to gain a better understanding of tuberculosis prevention and become active participants in promoting healthy behaviors, thereby supporting broader tuberculosis prevention efforts within high-density educational communities.

RESEARCH METHODS

This community service activity employed a pre-experimental one-group pretest–posttest design to evaluate the effectiveness of the "Lawan TBC" educational movement in improving students' knowledge regarding tuberculosis prevention. This design was selected because it allows the assessment of changes in participants' knowledge before and after the intervention within the same group, making it suitable for evaluating educational programs in community settings.

The activity was conducted at PP Assalafi Al Fithrah Surabaya, an Islamic boarding school characterized by a high-density communal living environment. The location was selected because Islamic boarding schools are considered high-risk settings for infectious disease transmission due to close daily interactions among students (Amalia et al., 2023; El Muna et al., 2024). Furthermore, Surabaya has a relatively high tuberculosis burden, highlighting the importance of implementing preventive interventions in such settings (Widiyana, 2023).

Data were collected from 38 students in grades 10–12 who were members of the student health volunteer group and agreed to participate in the program. The educational intervention was delivered through lectures, interactive discussions, and question-and-answer sessions covering tuberculosis transmission, symptoms, prevention strategies, cough etiquette, and the implementation of the "Lawan TBC" movement. A structured questionnaire was administered before the intervention (pretest) and immediately after the intervention (posttest) to assess participants' knowledge. The questionnaire consisted of multiple-choice questions, with each correct answer earning 1 point.

To ensure data validity, the same questionnaire was used for both pretest and posttest assessments. The questionnaire items were developed based on tuberculosis prevention guidelines issued by the Indonesian Ministry of Health and the World Health Organization (Kemenkes RI, 2020). All participants received the same educational materials and instructions delivered by the same facilitators. Completed questionnaires were checked for completeness before analysis. The collected data were analyzed using the Wilcoxon Signed-Rank Test to assess differences in knowledge scores before and after the intervention, with $p < 0.01$ set as the significance threshold.

RESULTS AND DISCUSSION

Results

A total of 38 students from grades 10–12 participated in the "Lawan TBC" educational program conducted at PP. Assalafi Al Fithrah Surabaya. The activity was implemented through educational lectures, interactive discussions, and question-and-answer sessions focusing on tuberculosis transmission, signs and symptoms, prevention strategies, cough etiquette, and healthy living behaviors within the Islamic boarding school environment. The educational sessions were delivered directly by the community service team from the Faculty of Medicine, Universitas Nahdlatul Ulama Surabaya.



Figure 1. Community Service Activity at PP. Assalafi Al Fithrah Surabaya

Figure 1 shows the implementation of the "Lawan TBC" educational program attended by students of PP. Assalafi Al Fithrah Surabaya. In this activity, participants actively engaged in health education sessions, interactive discussions, and question-and-answer sessions on tuberculosis prevention and healthy living behaviors. The educational material covered basic knowledge of tuberculosis transmission, early symptoms, risk factors, and the importance of early detection and treatment adherence. In addition, facilitators emphasized personal hygiene, cough etiquette, ventilation, and nutrition as daily practices that support tuberculosis prevention in boarding school environments. The use of interactive methods, such as asking students to share their experiences and misconceptions about tuberculosis, helped increase attention and participation during the session. Overall, Figure 1 illustrates not only the implementation of the educational program but also students' active role as learners and potential agents of health promotion within their community.

Following the educational session, participants received basic health screening services, including anthropometric measurements, blood pressure examination, blood glucose testing, and individual health consultations with health professionals. These activities were conducted as part of the community health promotion program to identify early risk factors and provide personalized recommendations for maintaining health. Anthropometric measurements and blood pressure examinations helped detect nutritional status and potential hypertension, while blood glucose testing provided initial information about the risk of metabolic disorders. Health consultations offered participants the opportunity to ask questions about their health conditions, lifestyles, and specific concerns related to tuberculosis and other non-communicable diseases. Through this integrated approach, the program not only delivered knowledge but also provided direct health services tailored to students' needs. Thus, the screening component strengthened the preventive aspect of the intervention and supported the early identification of health problems in the pesantren setting.

The effectiveness of the educational intervention was assessed using pre-test and post-test questionnaires administered before and after the "Lawan TBC" session. The mean pre-test score was 35.53 ± 10.05 , indicating that participants' initial knowledge regarding tuberculosis prevention and healthy behaviors was relatively limited and varied across individuals. After the educational activities, the mean post-test score increased to

46.32 ± 7.86, indicating an improvement of 10.79 points in participants' knowledge. This increase suggests that the educational content, delivery methods, and interaction during the session were effective in enhancing students' understanding of tuberculosis and related health practices. Statistical analysis using the Wilcoxon Signed-Rank Test showed a significant difference between pre-test and post-test scores ($p = 9.45 \times 10^{-8}$; $p < 0.01$), confirming that the observed improvement was not due to chance. These results demonstrate that structured health education combined with engaging methods can produce measurable gains in knowledge among boarding school students.

In addition to improving knowledge, the results of the pre-test and post-test analysis indicate the potential of the "Lawan TBC" program to influence students' attitudes and intentions regarding health behavior change. Although this study primarily focused on cognitive outcomes, the increased scores suggest that students became more aware of the seriousness of tuberculosis and the importance of preventive measures in their daily lives. This awareness is expected to encourage them to adopt healthier habits, such as practicing proper cough etiquette, maintaining dormitory cleanliness, and seeking medical help when experiencing respiratory symptoms. The program also laid the foundation for future health promotion activities, as students who have gained a better understanding can act as peer educators or role models for their peers. Therefore, the educational intervention not only produced short-term improvements in knowledge but also provided initial momentum for longer-term changes in health behavior and the development of a more health-conscious school environment.

Table 1. Comparison of Knowledge Scores Before and After the Intervention

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Difference	p-value
Knowledge Score	35.53 ± 10.05	46.32 ± 7.86	+10.79	9.45×10^{-8}

Table 1 presents the comparison of participants' knowledge scores before and after the educational intervention. The results indicate an increase in the mean score from 35.53 during the pre-test to 46.32 during the post-test, with a mean difference of 10.79 points. This improvement reflects a substantial gain in students' understanding of tuberculosis prevention and healthy living behaviors after attending the "Lawan TBC" educational session. The reduction in score variability from the pre-test to the post-test also suggests that participants' levels of knowledge became more homogeneous, indicating that the intervention helped equalize understanding across the group. The Wilcoxon Signed-Rank Test showed a statistically significant difference between the two measurements, confirming that the observed increase in scores was not due to random variation but was associated with the educational program implemented.

In addition to highlighting the numerical improvement in knowledge, Table 1 also provides important information regarding the effectiveness of the educational strategy used in this program. The clear rise in mean scores demonstrates that the combination of lectures, discussions, and interactive question-and-answer sessions was successful in conveying key messages about tuberculosis prevention. These findings support the use of structured health education as a practical and impactful approach to increasing students' awareness in boarding school environments. The data in Table 1 can serve as a reference for educators and health practitioners in designing similar interventions, as it shows that relatively short but well-planned sessions can lead to measurable cognitive gains. Therefore, Table 1 not only summarizes the statistical results but also reinforces the value of integrating evidence-based health education into routine school activities.

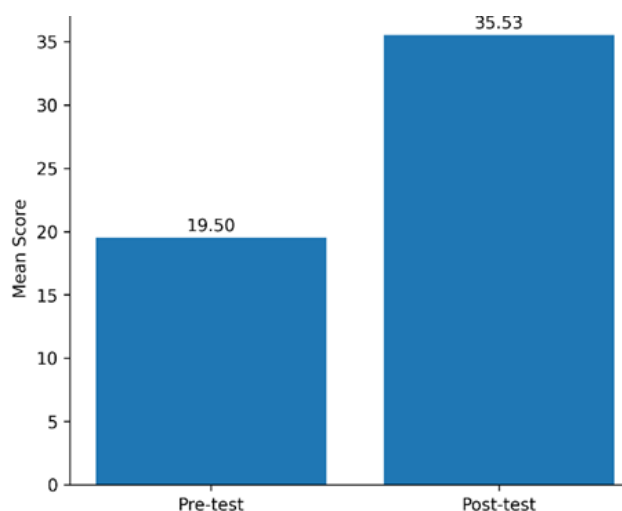


Figure 2. Comparison of Mean Pre-test and Post-test Scores

Figure 2 illustrates the increase in participants' mean knowledge scores following the educational intervention. The post-test mean score was higher than the pre-test mean score, indicating improved knowledge regarding tuberculosis prevention after participation in the "Lawan TBC" educational program.

The results of this community-based educational intervention suggest that interactive, lecture-based programs combined with health screening can significantly enhance students' knowledge of tuberculosis prevention and healthy lifestyle practices. The increase in mean knowledge scores from 19.50 to 35.53 indicates that participants assimilated critical information regarding disease transmission, symptom recognition, and preventive behaviors. Active engagement during discussions and Q&A sessions likely reinforced understanding and retention. Additionally, incorporating culturally relevant practices within the boarding school context may have strengthened the program's relevance, promoting positive attitudes toward maintaining personal and community health. The statistically significant findings highlight that even short-term educational interventions can yield measurable improvements in knowledge. Furthermore, the health screening component complements theoretical learning by providing tangible, practical experiences, helping students connect information with self-care practices. This integrated approach demonstrates the value of combining education and health promotion in structured community settings.

Beyond knowledge enhancement, the "Lawan TBC" program likely contributed to the broader development of health awareness and behavioral intention among participants. Exposure to preventive strategies, proper cough etiquette, and general hygiene practices may encourage sustained health-conscious behaviors within the school community. Early identification of health risks through screening can prompt timely interventions, potentially reducing the incidence and severity of tuberculosis and related health conditions. The program also fosters peer learning, as students discuss and reinforce concepts collectively, creating a supportive environment for behavioral change. Implementing such interventions in religious and educational institutions demonstrates that community-based approaches are effective in reaching adolescents and promoting public health goals. Continued monitoring, follow-up sessions, and reinforcement activities could further solidify knowledge retention and translate educational gains into

long-term health behaviors, supporting a comprehensive strategy for tuberculosis prevention and adolescent well-being.

The program's success also suggests that tuberculosis prevention education is more effective when delivered through an approach that is both informative and participatory. Rather than relying solely on passive instruction, the combination of explanation, discussion, and screening created a more meaningful learning experience for students. This format allowed participants to ask questions directly, clarify misconceptions, and relate the material to their daily routines in the boarding school environment. Such interaction is important because tuberculosis prevention is not only about knowledge but also about consistent habits, such as maintaining cleanliness, ensuring proper ventilation, and recognizing early symptoms. By linking health education with concrete screening activities, the program helped students understand that prevention begins with awareness and continues through responsible behavior. In this way, the intervention did not simply increase factual knowledge but also encouraged students to see health maintenance as part of their daily discipline and collective responsibility.

In a broader perspective, the findings provide support for integrating health promotion into school-based community service programs. Adolescents are a strategic group for such interventions because they are at a stage of rapid development and are capable of adopting long-term preventive behaviors when given appropriate guidance. The boarding school setting is particularly relevant, as students live in proximity and share common spaces, which can increase the risk of disease transmission if preventive measures are weak. Therefore, programs like "Lawan TBC" are valuable not only for improving individual knowledge but also for strengthening collective awareness within the institution. The positive outcomes of this intervention indicate that schools can serve as effective sites for public health education, early detection, and behavioral reinforcement. If sustained through follow-up activities and periodic screening, this model has the potential to contribute to healthier school communities and to support wider tuberculosis control efforts.

Discussion

The findings demonstrated that the "Lawan TBC" educational movement significantly improved students' knowledge regarding tuberculosis prevention. The increase in knowledge scores following the intervention indicates that health education can effectively enhance understanding of tuberculosis transmission, symptoms, prevention strategies, and cough etiquette among adolescents living in boarding school environments. These findings support the importance of educational interventions as a component of community-based tuberculosis prevention programs.

The present findings are consistent with previous studies that report that tuberculosis education programs significantly improve knowledge and awareness among adolescents and community members. Banowati et al. (2025) and R. Sugiri et al. (2025) reported that structured educational interventions improved participants' understanding of TB prevention and encouraged the adoption of healthier behaviors. Similarly, the current study found a significant increase in knowledge following the intervention, indicating that educational approaches combining lectures and interactive discussions are effective in delivering health-related information.

The intervention's effectiveness may be attributed to the participatory learning approach used during the program. Interactive discussions and question-and-answer sessions enabled participants to actively engage with the educational content and clarify misconceptions regarding tuberculosis prevention. These findings align with previous studies suggesting that adolescents are highly receptive to educational interventions and can function as agents of change within their communities (Santoso et al., 2023).

Islamic boarding schools are recognized as high-risk environments for infectious disease transmission because students live in densely populated dormitories, share facilities, and interact closely for prolonged periods (Amalia et al., 2023; El Muna et al., 2024). Such conditions may facilitate the airborne transmission of *Mycobacterium tuberculosis* if preventive behaviors and health literacy remain inadequate. Therefore, improving students' knowledge of respiratory hygiene, cough etiquette, and early symptom recognition is essential to reduce the risk of TB transmission within the boarding school community (Ananto et al., 2024; Rahmawati et al., 2025).

From a theoretical perspective, the findings support the concept that knowledge is an important determinant of preventive health behavior. Increased understanding of disease transmission and prevention may encourage individuals to adopt healthier practices, including maintaining personal hygiene, practicing proper cough etiquette, and seeking medical attention when symptoms occur. These preventive measures are particularly important in tuberculosis control because delayed diagnosis and poor preventive behavior contribute to continued disease transmission and adverse health outcomes (Gopaldaswamy et al., 2021; González-Cortiñas et al., 2023).

From a practical perspective, the study highlights the potential to integrate tuberculosis education into routine health promotion activities in Islamic boarding schools. Educational programs such as the "Lawan TBC" movement can strengthen students' capacity to recognize TB symptoms, practice preventive behaviors, and disseminate health information among their peers. Maintaining healthy lifestyles, including adequate nutrition, regular physical activity, proper hygiene, and adherence to preventive practices, remains essential in supporting tuberculosis prevention efforts among adolescents (Dewi, 2023; Daradkeh et al., 2025). The present study contributes empirical evidence regarding the effectiveness of community-based tuberculosis education in Islamic boarding school settings. It supports the development of sustainable health promotion initiatives targeting adolescents in high-density educational environments.

CONCLUSION

The "Lawan TBC" educational program successfully improved students' knowledge regarding tuberculosis prevention in the Islamic boarding school environment, as evidenced by the significant increase in post-test scores compared with pre-test scores. These findings demonstrate that community-based health education can serve as an effective strategy to enhance awareness of TB transmission, symptoms, prevention measures, and cough etiquette among adolescents living in high-density settings. The results have practical implications for strengthening tuberculosis prevention efforts in educational institutions and may be applied more broadly in other boarding schools and community settings with similar characteristics. It is recommended that school administrators, health professionals, and local health authorities collaborate to integrate regular TB education and health promotion activities into routine school

programs to support sustainable preventive behaviors. Future research and community service initiatives should involve larger, more diverse participant populations, employ comparative or longitudinal study designs, and assess long-term behavioral changes to understand better the sustainability and broader impact of tuberculosis prevention interventions among adolescents.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to PP. Assalafi Al Fithrah Surabaya for their support and cooperation throughout this community service activity. Appreciation is also extended to the participating students, the Faculty of Medicine, Universitas Nahdlatul Ulama Surabaya, and all individuals who contributed to the successful implementation of the "Lawan TBC" program.

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