



Differences in The Effectiveness of Health Education Using Youtube Videos and Leaflets in Improving The Knowledge of Patients With Pulmonary Tuberculosis

Dewi Fitriyah^{1*}, Iskim Luthfa², Iwan Ardian³

¹⁻³ Universitas Islam Sultan Agung, Indonesia

Email: dewifitriyah@uissula.ac.id¹

Article Info :

Received:
26-08-2026
Revised:
10-09-2026
Accepted:
15-09-2026

Abstract

Pulmonary tuberculosis remains a persistent public health challenge that requires effective patient education to support treatment and prevention. This study compared the effectiveness of health education using YouTube videos and printed leaflets in improving knowledge among pulmonary tuberculosis patients at Harapan Anda Islamic General Hospital, Tegal City. A quantitative quasi-experimental two-group pretest-posttest design was applied to 50 participants, consisting of 25 patients in the YouTube group and 25 in the leaflet group. Knowledge was measured before and after the intervention using a 16-item questionnaire. The YouTube group increased from a mean score of 8.40 to 14.64, while the leaflet group increased from 8.12 to 11.28. Wilcoxon tests showed significant improvements in both groups ($p < .001$). The mean gain score was 5.52 for YouTube and 2.88 for leaflets. Mann-Whitney testing confirmed a significant between-group difference ($U = 139.500$; $Z = -3.357$; $p = .001$). YouTube-based education was therefore more effective and can be prioritized, while leaflets remain useful as complementary educational materials. These findings support integrating accessible audiovisual media into routine tuberculosis education to strengthen patient understanding across clinical settings.

Keywords: Health Education, Pulmonary Tuberculosis, YouTube Video, Leaflet, Patient Knowledge.



©2026 Authors.. This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.
(<https://creativecommons.org/licenses/by-nc/4.0/>)

INTRODUCTION

Pulmonary tuberculosis (TB) remains a major public health challenge because of its persistent transmission, prolonged treatment requirements, and substantial consequences for patients and health systems. Indonesia continues to face a considerable TB burden, indicating that disease control requires sustained interventions beyond pharmacological treatment alone (Kementerian Kesehatan Republik Indonesia, 2025). Socioeconomic and environmental conditions may further influence the distribution and persistence of tuberculosis within communities, particularly among populations with limited access to adequate health information (Kusumaningrum et al., 2023). Effective TB control therefore requires strategies that simultaneously strengthen treatment adherence, preventive behavior, and patients' understanding of the disease.

Tuberculosis treatment generally requires patients to follow a prolonged therapeutic regimen, which may increase the risk of treatment fatigue and premature discontinuation. Inadequate understanding of the disease can lead patients to assume that treatment may be stopped once clinical symptoms diminish, even though completion of therapy remains essential for achieving successful outcomes. Buryanti (2021) identified patient-related factors as important elements associated with multidrug-resistant tuberculosis, while Yunita et al. (2025) emphasized the role of educational interventions in supporting adherence to TB treatment. Patient knowledge regarding transmission, symptoms, prevention, and treatment consequently represents an important foundation for maintaining appropriate health behavior throughout the therapeutic process.

Health education is an essential component of tuberculosis management because it enables patients to obtain accurate and understandable information regarding their condition. Educational interventions can improve patients' ability to recognize transmission risks, follow treatment recommendations, and adopt preventive behaviors within their households and communities (Mardila et al., 2023). Fawwaz et al. (2022) also demonstrated that knowledge is closely related to preventive

practices among individuals exposed to information about pulmonary tuberculosis. The effectiveness of health education, however, depends not only on the accuracy of the message but also on the medium through which the information is delivered.

The rapid development of digital technology has expanded opportunities for delivering health education through audiovisual and internet-based platforms. Audiovisual media integrate images, narration, sound, text, and moving illustrations, enabling complex health information to be presented in a more concrete and engaging manner. Agustina et al. (2024) reported that audiovisual-based education can support medication adherence among patients with tuberculosis by facilitating the delivery of structured and understandable information. Similar findings were reported by Khayati et al. (2020), who found that video-based education influenced patients' knowledge, attitudes, and treatment adherence in pulmonary TB management.

YouTube represents a widely accessible audiovisual platform that can be utilized to deliver health information in a format that patients can watch, hear, and review repeatedly. Its combination of visual and auditory elements may enhance attention and comprehension, particularly when educational content explains disease transmission, preventive measures, and treatment procedures that are difficult to communicate through text alone. The increasing use of digital health approaches is also reflected in TB-related interventions using mobile applications, such as the TOBAT application developed to support treatment adherence (Fahrnunisa et al., 2023). Visual educational strategies have likewise been applied in tuberculosis health promotion, demonstrating the growing relevance of media-based approaches for improving public and patient understanding (Putrianti et al., 2024).

Leaflets remain a commonly used medium in health education because they are inexpensive, portable, simple to distribute, and can be reread without requiring electronic devices or internet access. Written information accompanied by relevant illustrations may help patients recall essential messages after direct educational sessions have ended. Sari et al. (2024) showed that leaflet-based information combined with reminder support can contribute to improving treatment-related outcomes, indicating that printed media continue to have practical value in patient education. The static nature of leaflets, however, may limit their ability to demonstrate dynamic processes or simultaneously stimulate visual and auditory learning compared with audiovisual media.

Previous studies have generally examined video, audiovisual, mobile application, poster, or printed educational media as separate interventions rather than directly comparing their relative effectiveness in the same patient population (Agustina et al., 2024; Fahrnunisa et al., 2023; Putrianti et al., 2024). Evidence specifically comparing YouTube-based health education with conventional leaflet education among pulmonary TB patients remains limited, particularly within hospital-based clinical settings. The present study focuses on pulmonary TB patients at Harapan Anda Islamic General Hospital in Tegal City, where a direct comparison between these two educational approaches had not previously been conducted. This gap is important because the effectiveness of educational media may vary according to patients' characteristics, health literacy, learning preferences, and the context in which health information is delivered.

The present study was therefore conducted to determine whether health education using YouTube videos and leaflets differs in its effectiveness in improving the knowledge of patients with pulmonary tuberculosis. The comparison focuses on changes in patient knowledge before and after each educational intervention and on the magnitude of improvement achieved by the two media. Evaluating these approaches is expected to provide empirical evidence for selecting educational media that are more responsive to patients' learning needs while remaining feasible for routine health services (Mardila et al., 2023; Agustina et al., 2024). The findings may also support health professionals and hospital administrators in developing more effective educational strategies to strengthen patient knowledge and contribute to sustainable tuberculosis prevention and control.

RESEARCH METHODS

This study employed a quantitative approach using a quasi-experimental design with a two-group pretest–posttest framework to compare health education delivered through YouTube videos with education delivered through printed leaflets. The study population consisted of 89 patients with pulmonary tuberculosis receiving treatment at Harapan Anda Islamic General Hospital, Tegal City, from January to March 2026. The sample size was calculated using the formula for comparing two means, resulting in 50 participants who were allocated into two groups consisting of 25 participants in

the YouTube group and 25 participants in the leaflet group. Participants were selected through purposive sampling based on predetermined eligibility criteria. The inclusion criteria were patients diagnosed with pulmonary tuberculosis who were undergoing treatment, conscious and able to communicate effectively, and willing to participate in the study; participants in the YouTube group were additionally required to own a smartphone and have internet access, whereas those in the leaflet group were required to be able to read adequately. Patients with critical conditions, severe communication difficulties, or incomplete questionnaire responses were excluded from the study.

Data were collected using a pulmonary tuberculosis knowledge questionnaire adapted from Siagian (2021), consisting of 16 Guttman-scale items covering five domains: definition, transmission, symptoms, prevention, and treatment of pulmonary tuberculosis. The research procedure began with a pretest, followed by a health education intervention consisting of a 4-minute and 42-second educational video for the YouTube group and a printed educational leaflet for the comparison group, after which both groups completed a posttest using the same questionnaire. Each intervention session lasted approximately 30–40 minutes and was conducted under direct researcher supervision to ensure that participants received and reviewed the educational material completely. The collected data were processed through editing, coding, entry, and cleaning procedures before statistical analysis was performed (Notoatmodjo, 2018). Univariate analysis was used to describe respondents' characteristics and the distribution of study variables, while bivariate analysis employed the Wilcoxon Signed-Rank Test to assess changes in knowledge scores before and after the intervention within each group and the Mann–Whitney U test to compare knowledge improvement between the two groups. Statistical significance was determined at a 95% confidence level with a p-value of $< .05$.

RESULTS AND DISCUSSION

Participant Characteristics and Their Relevance to Tuberculosis Health Education

The study involved 50 patients with pulmonary tuberculosis who were divided equally into the YouTube and leaflet groups, with 25 participants in each group. Participant characteristics were examined according to age, sex, and educational attainment because these variables may influence the way individuals receive, process, and retain health information. Descriptive analysis showed that the study population was predominantly composed of adults older than 36 years, with relatively balanced representation of men and women and a predominance of secondary-school educational backgrounds. These characteristics are relevant to health education because learning ability, previous educational exposure, and familiarity with health information can influence patients' understanding of tuberculosis-related messages (Notoatmodjo, 2020; Swarjana, 2022a).

Age distribution showed that 29 of the 50 participants (58.0%) were older than 36 years, making this the largest age category in the study. In the YouTube group, 16 participants (64.0%) were older than 36 years, compared with 13 participants (52.0%) in the leaflet group. Participants aged 21–35 years accounted for 16 individuals (32.0%) overall, while only five participants (10.0%) were younger than 20 years. The predominance of mature adults indicates that tuberculosis education in this population must accommodate adult learning characteristics and varying levels of previous exposure to health information.

The age profile may also have implications for the acceptance of digital educational media. Older adults can benefit from audiovisual explanations when information is presented clearly, sequentially, and at an appropriate pace, particularly when complex medical concepts are translated into concrete visual examples. Digital media may provide additional advantages by combining auditory and visual stimuli, although familiarity with smartphones and online platforms can vary considerably across age groups (Coyne et al., 2022). Health educators should therefore consider both cognitive accessibility and technological familiarity when selecting digital interventions for adult tuberculosis patients.

Sex distribution was relatively balanced across the total sample, with 26 men (52.0%) and 24 women (48.0%). The YouTube group contained 14 men (56.0%) and 11 women (44.0%), whereas the leaflet group consisted of 12 men (48.0%) and 13 women (52.0%). This distribution suggests that neither sex overwhelmingly dominated the total study population, although slight differences were evident between intervention groups. Sex should nevertheless be interpreted as one of several contextual factors because tuberculosis prevention and treatment behavior may also be influenced by family support, social roles, health beliefs, and access to information (Ginting & Fentiana, 2023).

Educational attainment further demonstrated that most participants had completed senior high school or an equivalent level, accounting for 21 respondents (42.0%). Fifteen participants (30.0%) had completed junior high school, nine (18.0%) had completed elementary school, and five (10.0%) had attained higher education. The predominance of secondary education suggests that most respondents possessed basic literacy sufficient to engage with both audiovisual and printed educational materials. Nevertheless, differences in educational background remain important because the capacity to interpret written health messages may vary, making the clarity and simplicity of educational content essential (Jatmika et al., 2019; Swarjana, 2022b).

Table 1. Sociodemographic Characteristics of Pulmonary Tuberculosis Patients in the YouTube and Leaflet Groups (n = 50)

Characteristic	Category	YouTube, (%)	n	Leaflet, (%)	n	Total, (%)	n
Age	<20 years	2 (8.0)		3 (12.0)		5 (10.0)	
	21–35 years	7 (28.0)		9 (36.0)		16 (32.0)	
	>36 years	16 (64.0)		13 (52.0)		29 (58.0)	
Sex	Male	14 (56.0)		12 (48.0)		26 (52.0)	
	Female	11 (44.0)		13 (52.0)		24 (48.0)	
Educational level	Elementary school	4 (16.0)		5 (20.0)		9 (18.0)	
	Junior high school	7 (28.0)		8 (32.0)		15 (30.0)	
	Senior high school/equivalent	11 (44.0)		10 (40.0)		21 (42.0)	
	Higher education	3 (12.0)		2 (8.0)		5 (10.0)	
Total		25 (100)		25 (100)		50 (100)	

The descriptive pattern presented in Table 1 shows that the two intervention groups included participants with broadly comparable sociodemographic profiles, although some proportional differences were present. Participants older than 36 years accounted for 64.0% of the YouTube group and 52.0% of the leaflet group, while the proportion with senior high-school education was 44.0% and 40.0%, respectively. Sex composition also differed slightly, with men being more frequent in the YouTube group and women being slightly more frequent in the leaflet group. These differences should be considered when interpreting intervention outcomes because sociodemographic characteristics may shape the way individuals engage with educational material, even though the present analysis was primarily descriptive rather than designed to establish statistical equivalence between groups.

Educational level is particularly relevant when comparing audiovisual and printed health education because each format imposes different cognitive and literacy demands. Leaflets primarily depend on the participant's ability and willingness to read, interpret illustrations, and integrate written information, whereas audiovisual media simultaneously provide spoken explanations and visual representations. Previous research has shown that visual and audiovisual health education can facilitate understanding of tuberculosis prevention and treatment by translating health information into more accessible formats (Mardila et al., 2023; Putrianti et al., 2024). The educational characteristics of the present sample therefore provide an appropriate context for assessing whether audiovisual presentation offers additional learning advantages over conventional printed materials.

The use of YouTube should also be interpreted within the broader expansion of digital communication in health education. Social media and internet-based platforms have become increasingly integrated into information-seeking and educational activities, allowing health messages to be distributed rapidly and repeatedly to users (Fitriani, 2021; We Are Social & Meltwater, 2023). Coyne et al. (2022) further emphasized that digital dissemination approaches can strengthen the communication of health research and innovation by making information more accessible and engaging. For tuberculosis patients who have access to smartphones and the internet, these characteristics may enable YouTube-based education to provide a more dynamic learning experience than static printed information.

Participant characteristics must also be interpreted in relation to tuberculosis-specific knowledge and preventive behavior. Fawwaz et al. (2022) reported an association between knowledge levels and tuberculosis transmission-prevention behavior, indicating that patients' understanding of the disease has practical implications beyond factual recall. Family knowledge and support are likewise important because tuberculosis management frequently occurs within household settings where relatives may influence treatment adherence and preventive practices (Ginting & Fentiana, 2023; Paisal, 2023). Health education interventions should therefore communicate information in a form that can be understood not only by patients but, when possible, also shared with family members.

The sociodemographic findings indicate that the study population represented predominantly adult pulmonary tuberculosis patients with secondary-level education and relatively balanced sex distribution. These characteristics provide an important contextual basis for interpreting subsequent changes in knowledge following YouTube- and leaflet-based health education because the effectiveness of educational media cannot be separated entirely from users' age, literacy, and ability to access information. Printed materials remain practical because they can be retained and reread, while digital audiovisual media offer multimodal presentation and repeated access that may improve comprehension for some patients (Sari et al., 2024; Coyne et al., 2022). The next stage of the analysis therefore needs to examine the actual pretest and posttest knowledge outcomes in each intervention group to determine whether these differing media characteristics translated into measurable improvements in pulmonary tuberculosis knowledge.

Changes in Pulmonary Tuberculosis Knowledge Following Health Education

The results demonstrated an increase in knowledge scores in both intervention groups after the delivery of health education. In the YouTube group, the mean knowledge score increased from 8.40 at pretest to 14.64 at posttest, representing an absolute increase of 6.24 points. In comparison, the leaflet group showed an increase from a mean score of 8.12 before the intervention to 11.28 after the intervention, corresponding to an increase of 3.16 points. These findings indicate that both educational approaches were capable of improving pulmonary tuberculosis knowledge, although the magnitude of change was greater among participants receiving YouTube-based education.

The baseline scores indicate that participants in both groups entered the intervention with relatively similar levels of knowledge. The YouTube group had a pretest score ranging from 5 to 11, with a mean of 8.40 and a standard deviation of 1.914, while the leaflet group also had a score range of 5 to 11, with a mean of 8.12 and a standard deviation of 1.739. This pattern suggests that inadequate knowledge concerning tuberculosis was not confined to one intervention group and supports the importance of structured patient education. Limited knowledge about pulmonary tuberculosis may interfere with patients' understanding of disease transmission, preventive practices, and the need to complete treatment as recommended (Dwiningrum et al., 2021; Yunita et al., 2025).

The posttest results revealed a marked divergence between the two intervention groups. Participants in the YouTube group achieved scores ranging from 12 to 16, with a mean of 14.64 and a standard deviation of 1.185, whereas participants in the leaflet group achieved scores ranging from 9 to 14, with a mean of 11.28 and a standard deviation of 1.791. The narrower posttest variation in the YouTube group suggests that the intervention was followed by consistently high knowledge scores across participants. Audiovisual education can support this process by combining verbal explanations with visual information, allowing patients to receive multiple cues simultaneously during the learning process (Agustina et al., 2024; Khayati et al., 2020).

The categorical analysis further illustrates the educational effect observed in the continuous knowledge scores. Before the intervention, none of the participants in either group were classified as having good knowledge, while 56.0% of the YouTube group and 64.0% of the leaflet group were classified as having poor knowledge. The remaining participants were categorized as having sufficient knowledge, accounting for 44.0% in the YouTube group and 36.0% in the leaflet group. This baseline distribution reinforces the need for targeted health education because inadequate understanding may contribute to inappropriate preventive behavior and poor adherence to tuberculosis treatment (Fawwaz et al., 2022; Paisal, 2023).

Table 2. Knowledge Scores, Knowledge Categories, and Within-Group Statistical Tests Before and After Health Education (n = 50)

Indicator	YouTube Group	Leaflet Group
Pretest score, minimum	5	5
Pretest score, maximum	11	11
Pretest mean $\pm$ SD	8.40 $\pm$ 1.914	8.12 $\pm$ 1.739
Posttest score, minimum	12	9
Posttest score, maximum	16	14
Posttest mean $\pm$ SD	14.64 $\pm$ 1.185	11.28 $\pm$ 1.791
Poor knowledge before intervention, n (%)	14 (56.0)	16 (64.0)
Poor knowledge after intervention, n (%)	0 (0.0)	4 (16.0)
Sufficient knowledge before intervention, n (%)	11 (44.0)	9 (36.0)
Sufficient knowledge after intervention, n (%)	2 (8.0)	17 (68.0)
Good knowledge before intervention, n (%)	0 (0.0)	0 (0.0)
Good knowledge after intervention, n (%)	23 (92.0)	4 (16.0)
Wilcoxon Z	-4.411	-4.187
p-value	0.000	0.000
Statistical interpretation	Significant	Significant

The categorical shift after the YouTube intervention was substantial, as 23 of 25 participants (92.0%) moved into the good-knowledge category and the remaining two participants (8.0%) were classified as having sufficient knowledge. No participant remained in the poor-knowledge category after exposure to the YouTube video. This distribution indicates that the educational content was understood by nearly all participants at a level sufficient to produce a strong categorical improvement. Audiovisual health education may enhance learning by making disease-related information more concrete, attractive, and easier to remember than information delivered through text alone (Mardila et al., 2023; Jatmika et al., 2019).

Improvement was also observed in the leaflet group, although the categorical pattern differed from that of the YouTube group. After the intervention, four participants (16.0%) achieved good knowledge, 17 participants (68.0%) were classified as having sufficient knowledge, and four participants (16.0%) remained in the poor-knowledge category. These findings confirm that printed educational materials can improve knowledge and remain useful because patients are able to retain and reread the information independently. Leaflets are therefore still relevant in health promotion, particularly when electronic access is limited, although their effectiveness can depend heavily on literacy, reading motivation, and the ability to interpret written health information (Sari et al., 2024; Swarjana, 2022b).

The Wilcoxon Signed-Rank Test confirmed that the observed pretest–posttest changes were statistically significant within both groups. The YouTube group produced a Z value of -4.411 with $p = 0.000$, while the leaflet group produced a Z value of -4.187 with $p = 0.000$. Because both p-values were below the predetermined significance threshold of .05, health education delivered through either YouTube videos or printed leaflets significantly improved participants' knowledge. These results support the broader role of health promotion in increasing patients' understanding of disease and strengthening their ability to make informed decisions regarding prevention and treatment (Notoatmodjo, 2020; Wiguna et al., 2023).

The significant improvement associated with YouTube may be related to its capacity to deliver information through synchronized visual and auditory channels. Images, spoken explanations, text, and movement can help patients connect abstract medical information with concrete examples, thereby reducing the cognitive effort required to interpret health messages. Digital platforms also allow educational content to be replayed, which may reinforce learning and facilitate repeated exposure outside the initial educational session (Coyne et al., 2022; Fitriani, 2021). These characteristics may be particularly valuable in tuberculosis education, where patients need to understand several interrelated topics including transmission, symptoms, medication, prevention, and treatment completion.

The significant improvement observed in the leaflet group should not be interpreted as evidence that printed media are ineffective. Leaflets can support health education by providing concise written information that remains available after the clinical encounter and can be shared with family members involved in patient care. Family participation may strengthen treatment behavior because knowledge, attitudes, and social support within the household can influence tuberculosis prevention and adherence practices (Ginting & Fentiana, 2023). Printed materials therefore retain practical value as complementary resources even when audiovisual media produce larger improvements in immediate knowledge outcomes.

Knowledge improvement has important clinical and public-health implications because pulmonary tuberculosis treatment requires sustained patient participation over an extended period. Patients who understand the disease are more likely to recognize that symptom reduction does not necessarily mean treatment can be discontinued and that incomplete therapy can contribute to unfavorable outcomes, including drug resistance. Buryanti (2021) highlighted factors associated with multidrug-resistant tuberculosis, while the national tuberculosis management guidelines emphasize the importance of adherence and comprehensive patient management throughout treatment (Kementerian Kesehatan Republik Indonesia, 2020). Strengthening patient knowledge through accessible education is therefore not merely an informational intervention but an important component of tuberculosis control.

The findings show that both YouTube-based and leaflet-based health education significantly improved pulmonary tuberculosis knowledge, but the descriptive magnitude of improvement was clearly greater in the YouTube group. The proportion of participants with good knowledge increased from 0.0% to 92.0% after YouTube education, whereas the corresponding increase in the leaflet group reached only 16.0%. These results provide an initial indication that audiovisual education may offer stronger immediate learning benefits than conventional printed education, while still recognizing the practical usefulness of leaflets in routine care. A direct between-group analysis of gain scores is therefore necessary to determine whether the observed difference in improvement is statistically significant and to establish which educational medium was more effective.

Comparative Effectiveness of YouTube Videos and Leaflets in Improving Pulmonary Tuberculosis Knowledge

The comparison of knowledge gain between the two intervention groups demonstrated a clear difference in the magnitude of improvement achieved after health education. Participants who received education through YouTube videos obtained a mean gain score of 5.52, whereas those who received leaflet-based education obtained a mean gain score of 2.88. The descriptive difference indicates that the increase in knowledge following audiovisual education was almost twice that observed following the printed intervention. This pattern supports the premise that the choice of educational medium may influence the extent to which patients absorb and retain tuberculosis-related information (Agustina et al., 2024; Khayati et al., 2020).

Variation in individual gain scores was also evident within both groups. The YouTube group recorded gain scores ranging from 1 to 9, with a standard deviation of 2.257, indicating that all participants experienced at least some positive improvement between pretest and posttest. In contrast, gain scores in the leaflet group ranged from -3 to 8, with a standard deviation of 2.774, showing greater variability in participants' responses to the printed educational material. Variability in health-learning outcomes can be influenced by literacy, attention, previous knowledge, individual learning characteristics, and differences in the way information is processed (Swarjana, 2022a; Nursalam, 2018).

The minimum gain score of -3 in the leaflet group is particularly noteworthy because it indicates that at least one participant obtained a lower posttest score than pretest score. This finding does not necessarily indicate that leaflet education reduced knowledge, but it demonstrates that printed information did not produce uniform improvement across all participants. Reading-based education requires active engagement, sufficient literacy, concentration, and the ability to interpret written explanations, which may differ considerably among patients (Notoatmodjo, 2018; Priadana & Sunarsi, 2021). Audiovisual education may reduce some of these barriers because information is reinforced simultaneously through narration, images, and visual demonstrations.

The between-group analysis confirmed that the descriptive difference in gain scores was statistically significant. The Mann–Whitney U test yielded $U = 139.500$ and $Z = -3.357$, with $p = 0.001$, demonstrating a significant difference in knowledge improvement between the YouTube and leaflet groups. Because the probability value was below the significance threshold of .05, the null hypothesis of no difference between the two educational approaches was rejected. These findings provide statistical evidence that YouTube-based health education was more effective than leaflet-based education in improving knowledge among pulmonary tuberculosis patients in this study.

Table 3. Comparison of Knowledge Gain Scores Between the YouTube and Leaflet Groups and Mann–Whitney U Test Results (n = 50)

Variable	YouTube Group	Leaflet Group
Number of participants (n)	25	25
Minimum gain score	1	-3
Maximum gain score	9	8
Mean gain score	5.52	2.88
Standard deviation	2.257	2.774
Mann–Whitney U	139.500	139.500
Z	-3.357	-3.357
p-value	0.001	0.001
Statistical interpretation	Significant difference	Significant difference

The superior gain observed in the YouTube group can be explained by the multimodal characteristics of audiovisual learning. YouTube videos can combine narration, text, moving images, and illustrations within a single educational sequence, allowing patients to receive related information through more than one sensory channel. Health-promotion media that stimulate both visual and auditory processing may facilitate comprehension and memory, particularly for information involving disease mechanisms, transmission routes, preventive measures, and treatment procedures (Jatmika et al., 2019; Wiguna et al., 2023). Previous audiovisual interventions among tuberculosis patients similarly suggest that video-based education can contribute to improved knowledge and treatment-related behavior (Mardila et al., 2023; Agustina et al., 2024).

The effectiveness of digital education is also supported by the increasingly prominent role of digital communication in health-information dissemination. Internet-based platforms can provide educational content in repeatable and engaging formats and allow users to revisit information after the initial learning session (Coyne et al., 2022). Digital educational approaches are particularly relevant as patients increasingly encounter health information through social media and mobile technologies, although information quality and accessibility must remain carefully controlled (Fitriani, 2021; We Are Social & Meltwater, 2023). The use of dedicated health applications for tuberculosis medication adherence further illustrates how digital platforms may complement conventional educational strategies (Fahrurnnisa et al., 2023).

Leaflets nevertheless remain useful within tuberculosis health education and should not be regarded as an ineffective medium solely because their gain score was lower in the present comparison. Printed materials are inexpensive, easily distributed, do not require smartphones or internet access, and can be retained by patients and families for repeated consultation. Educational posters and printed information have continued to demonstrate value in communicating tuberculosis-prevention messages, particularly where digital access is inconsistent (Putrianti et al., 2024; Sari et al., 2024). Consequently, the significant difference observed in this study should support more strategic media selection rather than complete replacement of printed materials.

The findings also have implications for broader tuberculosis-control efforts because inadequate understanding of disease transmission and treatment may contribute to poor preventive practices and treatment discontinuation. Tuberculosis remains an important communicable disease requiring sustained prevention, early recognition, treatment adherence, and community participation (Centers for Disease Control and Prevention, 2016; Handayani & Sumarni, 2021). Indonesian tuberculosis-control efforts similarly emphasize the need to strengthen patient and community engagement as part of strategies aimed at ending tuberculosis (Kementerian Kesehatan Republik Indonesia, 2025).

Socioeconomic and environmental factors may further shape vulnerability to tuberculosis, reinforcing the importance of educational interventions that are accessible to diverse patient populations (Kusumaningrum et al., 2023).

Patient education should therefore be positioned as part of a broader behavioral and community-based tuberculosis-control strategy rather than as a stand-alone transfer of information. Community education, cadre involvement, and family participation may strengthen patients' ability to translate knowledge into preventive actions and sustained treatment behavior (Donsu et al., 2020; Rita et al., 2020). Marna et al. (2023) similarly highlighted the contribution of health education to tuberculosis prevention, while Melanie (2021) demonstrated the continued relevance of public knowledge and attitudes toward pulmonary tuberculosis. Knowledge improvement through effective educational media can consequently provide an important cognitive foundation for behavioral change, although longitudinal research would be required to establish whether the improvements observed in the present study persist and translate into actual adherence or prevention outcomes.

Implementation of YouTube-based education in routine hospital care should also consider the characteristics and resources of patients and healthcare institutions. A stakeholder-oriented approach suggests that effective implementation involves coordination among patients, families, nurses, other health professionals, and hospital management because each party contributes to the sustainability of patient education (Freeman, 2010). Printed leaflets can serve as complementary materials for individuals with limited digital access, whereas video education can provide a richer explanation for patients who can use smartphones and internet-based resources. Such integration is consistent with health-promotion principles that emphasize selecting educational strategies according to target-population characteristics and available resources (Notoatmodjo, 2020; Septarini, 2017).

The results provide consistent evidence that both educational media improved knowledge, but YouTube videos produced a significantly greater increase than leaflets among pulmonary tuberculosis patients at Harapan Anda Islamic General Hospital, Tegal City. The mean gain score of 5.52 in the YouTube group compared with 2.88 in the leaflet group, together with the Mann–Whitney result of $U = 139.500$, $Z = -3.357$, and $p = 0.001$, establishes the statistical superiority of the audiovisual intervention in this sample. The finding complements previous evidence that appropriately designed educational interventions can strengthen patients' knowledge, treatment adherence, and tuberculosis-prevention behavior (Dwiningrum et al., 2021; Fawwaz et al., 2022; Yunita et al., 2025). YouTube may therefore be prioritized as an audiovisual educational tool while leaflets remain valuable as complementary materials, creating a combined educational strategy capable of accommodating differences in digital access, literacy, and individual learning preferences.

CONCLUSION

Health education using both YouTube videos and printed leaflets significantly improved knowledge among pulmonary tuberculosis patients at Harapan Anda Islamic General Hospital, Tegal City. The YouTube group demonstrated a greater increase in mean knowledge scores, from 8.40 before the intervention to 14.64 after the intervention, while the leaflet group increased from 8.12 to 11.28. The Wilcoxon Signed-Rank Test confirmed significant pretest–posttest improvements in both groups, indicating that each educational medium was effective in strengthening patients' understanding of pulmonary tuberculosis.

The comparative analysis demonstrated that YouTube-based education was more effective than leaflet-based education, as reflected by a mean gain score of 5.52 in the YouTube group compared with 2.88 in the leaflet group. The Mann–Whitney U test further confirmed a significant difference between the two interventions ($U = 139.500$; $Z = -3.357$; $p = .001$). These findings support the use of YouTube videos as a primary audiovisual medium for tuberculosis health education, while printed leaflets can continue to serve as complementary materials, particularly for patients with limited access to digital technology or those who require information that can be reread independently.

REFERENCES

- Adiputra, I. M. S., Trisnadewi, N. W., Oktaviani, N. P. W., Munthe, S. A., Hulu, V. T., Budiastutik, I., Faridi, A., Ramdany, R., Fitr Sianturi, E., & Suryana. (2021). *Metodologi penelitian kesehatan*. Yayasan Kita Menulis.

- Agustina, A. H., Purnama, A., & Koto, Y. (2024). Pengaruh edukasi berbasis media audiovisual terhadap kepatuhan minum obat pada pasien tuberkulosis. **Journal of Management Nursi(1)*, 146–154. <https://doi.org/10.35971/gojhes.v5i1.9699>
- Centers for Disease Control and Prevention. (2016). *Tuberculosis (TB)*. Centers for Disease Control and Prevention.
- Coyne, P., Kustra, E., & Woodruff, S. J. (2022). Let's talk about it: A narrative review of digital approaches for disseminating and communicating health research and innovation. *Journal of Public Health Management and Practice*, 28(5), 541–549. <https://doi.org/10.1097/PHH.0000000000001518>
- Donsu, J. D. T., Yuniritha, E., Palestin, B., Trisnowiyanto, B., Ekwantini, R. D., & Herawati, L. (2020). *Menuju desa sehat bebas tuberkulosis: Pencegahan tuberkulosis melalui program pengembangan desa sehat (PPDS)*. Husada Mandiri.
- Dwiningrum, R., Wulandari, R. Y., & Yunitasari, E. (2021). Hubungan pengetahuan dan lama pengobatan TB paru dengan kepatuhan minum obat pada pasien TB paru di Klinik Harum Melati. *Jurnal Aisyah: Jurnal Ilmu Kesehatan*, 6(S1), 209–214. <https://doi.org/10.30604/jika.v6iS1.788>
- Fahrurnisa, F. (2023). Edukasi kepatuhan pasien TB melalui aplikasi TOBAT (Tekun Minum Obat). *Jurnal Abdi Mahosada*, 1(2), 45–50. <https://doi.org/10.54107/abdimahosada.v1i2.199>
- Fawwaz, F., Susanto, A., & Sukmaningtyas, W. (2022). Hubungan tingkat pengetahuan dengan pencegahan penularan tuberkulosis paru di Balai Kesehatan Paru Masyarakat (BKPM) Purwokerto. *Jurnal Sehat Mandiri*, 17(2), 69–77. <https://doi.org/10.33761/jsm.v17i2.673>
- Fitriani, Y. (2021). Pemanfaatan media sosial sebagai media penyajian konten edukasi atau pembelajaran digital. *Journal of Information System, Applied, Management, Accounting and Research*, 5(4), 1006–1013. <https://doi.org/10.52362/jisamar.v5i4.609>
- Freeman, R. E. (2010). *Strategic management: A stakeholder approach*. Cambridge University Press. <https://doi.org/10.1017/CBO9781139192675>
- Ginting, D., & Fentiana, N. (2023). Hubungan pengetahuan, sikap dan dukungan keluarga dengan risiko penularan TB paru. *Jurnal Ilmu Kesehatan dan Gizi*, 1(4), 88–93. <https://doi.org/10.55606/jikg.v1i4.1710>
- Handayani, I., & Sumarni. (2021). *Tuberkulosis*. Penerbit NEM.
- Jatmika, S. E. D., Maulana, M., Kuntoro, & Martini, S. (2019). *Buku ajar pengembangan media promosi kesehatan*. K-Media.
- Kementerian Kesehatan Republik Indonesia. (2020). *Pedoman nasional pelayanan kedokteran tata laksana tuberkulosis*. Kementerian Kesehatan Republik Indonesia.
- Kementerian Kesehatan Republik Indonesia. (2025, April 11). *Gerakan Indonesia akhiri TBC*. Kementerian Kesehatan Republik Indonesia.
- Khayati, F. N., Mulyani, E. S., & Purnomo, R. T. (2020). Pengaruh edukasi dengan media video terhadap pengetahuan, sikap dan kepatuhan berobat pada penderita TB paru di Balkesmas wilayah Klaten. *Prosiding University Research Colloquium*, 79–87.
- Kusumaningrum, A., Wulandari, G., & Kautsar, A. (2023). Tuberkulosis di Indonesia: Apakah status sosial-ekonomi dan faktor lingkungan penting? *Jurnal Ekonomi dan Pembangunan Indonesia*, 23(1), 1–14. <https://doi.org/10.21002/jepi.2023.01>
- Mardila, I., Sari, I. P., & Ardiansyah. (2023). Pengaruh pendidikan kesehatan dengan audiovisual terhadap perilaku pencegahan penularan pada keluarga dengan tuberkulosis paru. *Jurnal Penelitian Perawat Profesional*, 5(4), 1625–1632. <https://doi.org/10.37287/jppp.v5i4.1901>
- Marna, A., Palamba, A., & Padang, J. D. (2023). Pengaruh pendidikan kesehatan terhadap pengetahuan masyarakat tentang pencegahan penyakit TB tahun 2023. *Jurnal Ilmiah Kesehatan Promotif*, 8(1), 70–88. <https://doi.org/10.56437/jikp.v8i1.139>
- Melanie, N. G. (2021). *Tingkat pengetahuan dan sikap masyarakat tentang tuberkulosis paru pada masa pandemi COVID-19 di Kabupaten Tangerang* [Skripsi, Universitas Islam Negeri Syarif Hidayatullah Jakarta].
- Notoatmodjo, S. (2018). *Metodologi penelitian kesehatan*. Rineka Cipta.
- Notoatmodjo, S. (2020). *Promosi kesehatan dan perilaku kesehatan*. Rineka Cipta.
- Nursalam. (2018). *Metodologi penelitian ilmu keperawatan: Pendekatan praktis*. Salemba Medika.

- Paisal, R. (2023). Hubungan pengetahuan keluarga pasien tentang tuberkulosis paru dengan perilaku keluarga pasien dalam upaya pencegahan tuberkulosis paru di ruang poli penyakit paru RSUD Palabuhan Ratu Kabupaten Sukabumi. *Jurnal Health Society*, 12(1), 30–37. <https://doi.org/10.62094/jhs.v12i1.74>
- Priadana, S., & Sunarsi, D. (2021). *Metode penelitian kuantitatif*. Pascal Books.
- Putrianti, W. A., Giftarina, B., Batari, A. N. A.-Z. P., Ferdinan, L. F., Putri, I. D. A., Setiawan, Y., & Chaidir, L. (2024). Pengaruh edukasi kesehatan melalui media visual poster di Posyandu Jatinangor terkait penyakit tuberkulosis pada anak. *Kontribusi: Jurnal Penelitian dan Pengabdian Kepada Masyarakat*, 4(2), 364–377. <https://doi.org/10.53624/kontribusi.v4i2.412>
- Rita, E., Awaliah, Herlinah, L., Anwar, S., Isro, A., Amalia, H., & Ardiansyah, D. A. (2020). *Modul tuberkulosis pada kader TB*. Fakultas Ilmu Keperawatan, Universitas Muhammadiyah Jakarta.
- Sari, W. A., Hartini, S., & Nisa, N. (2024). Pengaruh leaflet dan WhatsApp reminder terhadap kepatuhan minum obat pada anak tuberkulosis. *Jurnal Kesehatan Tambusai*, 5(3), 7558–7565. <https://doi.org/10.31004/jkt.v5i3.33418>
- Septarini, N. W. (2017). *Metode pengendalian penyakit menular*. Fakultas Kedokteran, Universitas Udayana.
- Swarjana, I. K. (2022a). *Konsep pengetahuan, sikap, dan perilaku*. CV Andi Offset.
- Swarjana, I. K. (2022b). *Konsep: Pengetahuan, sikap, perilaku, persepsi, stres, kecemasan, nyeri, dukungan sosial, kepatuhan, motivasi, kepuasan, pandemi COVID-19, akses layanan kesehatan*. Andi.
- We Are Social, & Meltwater. (2023). *Digital 2023: Global overview report*. DataReportal.
- Candrawati, R. D., Wiguna, P. K., Malik, M. F., Nurdiana, A., Salbiah, Runggandini, S. A., Yanti, I., Jamaluddin, Setiawati, R., Marlina, R., Suryani, L., Isnani, T., Iswono, Bagiastra, I. N., & Salman. (2023). *Promosi dan perilaku kesehatan*. Eureka Media Aksara.
- Lailiana, D. Y. D., S. D., M. F., Amanda, C. P., Mukarromah, I. W., Angrayni, R., Seran, M., Sabhira, A. S., Aristia, B. F., Laili, A., & Nurhidayah, E. P. (2025). Literatur review: Pengaruh media edukasi dalam meningkatkan kepatuhan pengobatan pasien tuberkulosis. *Jurnal Pembangunan dan Kemandirian Kesehatan*, 2(1), 31–38. <https://doi.org/10.66340/ay2qxxg55>