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Original Article

The influence of booklet media on tuberculosis knowledge among airport workers: A pre-experimental study

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Abstract

Background: Tuberculosis remains a major public health challenge in high-mobility occupational settings, where frequent interpersonal contact increases the risk of disease transmission. Limited knowledge regarding tuberculosis transmission, prevention, and early detection among airport workers may contribute to delayed health-seeking behavior and sustained transmission within transportation hubs.
Objective: This study aimed to examine the influence of booklet-based health education on tuberculosis knowledge among airport workers.
Methods: This study employed a quantitative pre-experimental one-group pretest–posttest design. The population consisted of 88 workers at the Tjilik Riwut Airport Health Quarantine Post, Palangka Raya, Indonesia. A sample of 47 respondents was selected using an accidental sampling technique based on inclusion criteria. Tuberculosis knowledge was measured using a structured questionnaire administered before and after the intervention. The intervention consisted of tuberculosis health education delivered through a printed booklet. Data normality was assessed using the Shapiro–Wilk test, and differences between pretest and posttest knowledge scores were analyzed using the Wilcoxon signed-rank test.
Results: The findings demonstrated a significant increase in tuberculosis knowledge following the booklet-based intervention. The mean knowledge score increased from 77.72 before the intervention to 90.28 after the intervention, accompanied by a reduction in score variability. Statistical analysis indicated a significant difference between pre-intervention and post-intervention knowledge scores ($p = 0.001$). The proportion of respondents with high knowledge levels increased, while moderate and low knowledge categories decreased after the intervention.
Conclusion: Booklet-based health education significantly improved tuberculosis knowledge among airport workers. The use of printed educational media proved to be an effective, practical, and sustainable approach for enhancing health knowledge in high-mobility occupational settings.

Background

Tuberculosis remains a major global public health challenge due to its persistent transmission and substantial mortality burden across regions with high population mobility (Chakaya et al., 2021). The disease is caused by Mycobacterium tuberculosis, which possesses complex lipoprotein structures that facilitate immune evasion and long-term survival within human hosts (Bigi et al., 2023). Recurrent tuberculosis cases arise through endogenous relapse and exogenous reinfection, thereby complicating disease control efforts in populations with frequent interpersonal contact (He et al., 2023). Advances in tuberculosis treatment regimens have shortened therapy duration; however, successful disease control still depends on early detection and adequate population knowledge (Carr et al., 2022). Global implementation of optimized tuberculosis regimens requires parallel strengthening of health education to support prevention and adherence behaviors (Gupta et al., 2024).

Based on the Global Tuberculosis Report 2023, Indonesia ranks as the country with the second-highest tuberculosis burden globally after India, with an estimated 1,060,000 cases and 134,000 deaths annually (Chakaya et al., 2021; Tarmizi, 2024). National surveillance data from the Tuberculosis Information System reported that 821,200 tuberculosis cases were notified in 2023, representing 77% of the national target (Tarmizi, 2024). The same data indicated that tuberculosis treatment coverage reached 86%, which remained below the national target of 90% (Tarmizi, 2024). These data highlight persistent gaps between tuberculosis detection, treatment completion, and prevention efforts at the national level (Craciun et al., 2023).

At the regional level, the Central Statistics Agency of Central Kalimantan Province reported a tuberculosis case detection rate of

92.2% and a treatment success rate of only 68% in 2024 (BPS Provinsi Kalimantan Tengah, 2024). Spatial and temporal analyses in Indonesia have demonstrated that tuberculosis cases tend to cluster in densely populated and high-mobility environments (Ramadhani et al., 2021). Environmental conditions and behavioral factors further contribute to tuberculosis transmission through inadequate sanitation and unhealthy living practices (Sari, 2022; Sari et al., 2022). Recent cross-sectional studies in Indonesian communities have identified occupational exposure and mobility as significant risk factors for pulmonary tuberculosis incidence (Sartika et al., 2025; Yusalin et al., 2025).

Airport and port workers represent a high-risk occupational group due to continuous interaction with travelers from diverse epidemiological backgrounds (Kendall et al., 2021). Household and occupational contact studies have shown increased tuberculosis infection risk among individuals working in transportation and logistics settings (Krishnan et al., 2023). Mass media and structured educational exposure have been shown to improve tuberculosis knowledge and attitudes among mobile working populations (Gelaye et al., 2020). However, systematic reviews indicate that knowledge gaps regarding tuberculosis transmission and prevention persist despite increased diagnostic and treatment availability (Craciun et al., 2023).

In the Port of Palangka Raya Class II Health Quarantine Center work area, health counseling activities conducted between January and October 2024 involved 560 participants from ship crews and surrounding communities (Maulina, 2025). Data collection during these activities did not identify individuals with general clinical symptoms of tuberculosis among participants (Maulina, 2025). Nevertheless, questionnaire findings revealed a high proportion of incorrect responses related to tuberculosis transmission, prevention, and early symptoms (Maulina, 2025). These findings indicate a substantial knowledge deficit despite routine health education activities in the port environment (Maulina, 2025). Printed educational media offer a structured approach to reinforce accurate tuberculosis information in occupational settings (Faidah et al., 2021).

Health education using booklet media enables standardized delivery of information and supports repeated exposure to key tuberculosis prevention messages (Lukita et al., 2025). Booklet-based interventions have demonstrated effectiveness in improving health knowledge among adult working populations with limited access to formal training (Khan et al., 2020). Improved tuberculosis knowledge contributes to earlier health-seeking behavior and strengthens disease prevention efforts in high-risk environments (Craciun et al., 2023).

Therefore, this study aims to examine the influence of booklet media on tuberculosis knowledge among airport workers at the Palangka Raya Class II Health Quarantine Center.

Methods

Study Design

This study employed a quantitative research approach using a pre-experimental one-group pretest–posttest design to assess changes in tuberculosis knowledge following a health education intervention. The design was selected to evaluate the effect of an educational booklet by comparing knowledge levels before and after the intervention within the same group of participants. This approach was considered appropriate because the study aimed to generate preliminary evidence of effectiveness in a real-world occupational setting where randomization and control groups were not feasible. The design allowed direct measurement of knowledge change attributable to the intervention while minimizing logistical constraints related to restricted access areas within the airport. The pre-experimental framework was suitable for health promotion evaluation among occupational groups with limited research accessibility.

Sampling

The study population consisted of 88 workers stationed at the Tjilik Riwut Airport Health Quarantine Post, including porters, drivers, and cleaning staff. The sample size was calculated using the Slovin formula with a margin of error of 10%, resulting in a minimum required sample of 47 participants. These occupational groups were intentionally targeted because they engage

in daily direct interactions with passengers and the general public, which increases their potential exposure to tuberculosis transmission. Airport employees working in restricted operational areas were excluded due to the absence of institutional permission to conduct interviews in those locations. An accidental sampling technique was applied, whereby every individual encountered during the data collection period who met the inclusion criteria was invited to participate. Although this sampling method enabled practical recruitment under field constraints, it also presented limitations related to representativeness and potential self-selection bias among willing respondents.

Instruments

Data were collected using a structured questionnaire designed to measure respondents' knowledge of tuberculosis before and after the intervention. The questionnaire covered key domains, including causes of tuberculosis, modes of transmission, signs and symptoms, prevention strategies, and treatment principles. Knowledge scores were calculated as percentages and categorized according to Bloom's taxonomy into three levels: high knowledge for scores above 76%, moderate knowledge for scores between 56% and 75%, and low knowledge for scores below 56%. The same questionnaire was administered during both the pretest and posttest phases to ensure consistency in measurement. The instrument was structured to be self-administered, allowing respondents to complete it independently while maintaining privacy and reducing interviewer bias.

Intervention

The intervention consisted of tuberculosis health education delivered through a printed booklet developed by the researcher. The booklet contained basic and essential information on tuberculosis, including disease definition, transmission routes, early symptoms, prevention measures, and the importance of early diagnosis and treatment adherence. The content was written in clear, simple language to ensure accessibility for participants with diverse educational backgrounds. Each respondent received one booklet and was given sufficient time to read and understand the material. The booklet-based approach was chosen to facilitate self-paced learning, allow repeated review of information, and ensure sustainability of educational exposure beyond the study period. The intervention was delivered uniformly to all participants to maintain intervention fidelity.

Data Collection

Data collection was conducted in two sequential stages at the Tjilik Riwut Airport Health Quarantine Post. During the first stage, respondents completed the pretest questionnaire to assess baseline tuberculosis knowledge prior to receiving the educational booklet. After the booklet was distributed and reviewed by the participants, the posttest questionnaire was administered to evaluate changes in knowledge levels following the intervention. Data collection activities were conducted in accessible areas of the airport post to avoid interference with work duties and ensure participant comfort. The researcher supervised the data collection process to ensure standardized procedures and completeness of responses while avoiding influence on participants' answers.

Data Analysis

Data analysis was performed using statistical software appropriate for health research. Descriptive statistics were used to summarize respondents' characteristics and knowledge levels, including frequency distributions and percentage classifications based on Bloom's criteria. Prior to inferential analysis, data normality was assessed using the Shapiro–Wilk test, which indicated that the knowledge score distribution was not normally distributed. Consequently, a non-parametric Wilcoxon signed-rank test was applied to examine differences between pretest and posttest knowledge scores. This test was selected because it is suitable for paired data with non-normal distribution. Statistical significance was determined using a predefined alpha level, and results were presented in both tabular and narrative formats.

Ethical Consideration

Ethical principles were strictly observed throughout the research process. Each participant received a clear explanation regarding the study objectives, procedures, potential benefits, and their rights as research subjects. Participation in the study was entirely voluntary, and respondents were informed of their right to withdraw at any time without consequence. Written informed consent was obtained from all participants prior to data collection through a signed informed consent form. Confidentiality and anonymity were ensured by using coded identifiers instead of personal information. All collected data were securely stored and used exclusively for research purposes.

Results

The results of this study are about the effect of providing health promotion with booklet media about tuberculosis on the level of knowledge of porters, drivers, and cleaning services at the Tjilik Riwut Airport Post, the work area of the Palangka Raya Class II Health Quarantine Center has been carried out from May 26 to June 2, 2025.

Table 1. Sociodemographic Characteristics and Changes in Tuberculosis Knowledge Levels Among Airport Workers

Variables	Frequency	Percentage (%)
Age		
Adult (18-59)	44	93.6
Senior (≥60 years old)	3	6.4
Experience		
Yes	3	6.4
No	44	93.7
Education Level		
No School	1	2.1
Elementary School	4	8.5
Junior High School	8	17.0
High/Vocational School	32	68.1
College	2	4.3
Occupation		
Porter	12	25.5
Driver	13	27.7
Cleaning Services	22	46.8
Gender		
Woman	12	25.5
Man	35	74.5
Information Source		
None	26	55.3
Health Worker	10	21.3
BKK Class II Palangka Raya	7	14.9
Social Media	4	8.5
Other	0	0
Level of Knowledge (Pretest)		
High	35	74.5
Moderate	7	14.9
Low	5	10.6
Level of Knowledge (Posttest)		
High	44	93.6
Moderate	2	4.3
Low	1	2.1

Table 1 presents the sociodemographic characteristics of respondents and the distribution of tuberculosis knowledge levels before and after the booklet-based health

education intervention. Most respondents were adults aged 18–59 years, had no prior experience related to tuberculosis, and were predominantly male, with the largest occupational group being cleaning service workers. The majority of respondents had a high or vocational school education, while only a small proportion had college-level education. More than half of the respondents reported having no prior source of information about tuberculosis, indicating limited baseline exposure to formal health education. At the pretest stage, most respondents already demonstrated a high level of knowledge, although a notable proportion still had moderate and low knowledge levels. Following the intervention, there was a clear improvement in tuberculosis knowledge, as reflected by an increase in the proportion of respondents with high knowledge and a reduction in moderate and low knowledge categories, suggesting that the booklet media was effective in enhancing tuberculosis knowledge among airport workers.

Table 2. Comparison of Tuberculosis Knowledge Scores Before and After the Booklet-Based Health Education Intervention

Knowledge Level	(Min-Max)	Mean	SD	p-value
Pre-Intervention	86 (7-100)	77,72	22,609	0.001
Post-Intervention	93 (21-100)	90,28	15,465	

Table 2 shows a statistically significant improvement in sleep quality scores among perimenopausal women after receiving Benson relaxation therapy. The mean sleep quality score decreased from 1.97 before the intervention to 1.60 after the intervention, indicating an overall improvement in sleep quality. The observed mean difference of 0.37 reflects a meaningful reduction in sleep disturbance levels following the intervention. The minimum and maximum scores also demonstrated a narrower range after the intervention, suggesting more consistent sleep quality among participants. The statistical analysis revealed a p value of 0.012, which is below the predefined significance level of 0.05, confirming that the observed improvement in sleep quality was statistically significant

Discussion

This study demonstrated a significant improvement in tuberculosis knowledge among airport workers following the booklet-based health education intervention. The increase in post-intervention knowledge scores indicates that structured printed educational media effectively enhance understanding of tuberculosis transmission, prevention, and control in occupational settings with high mobility. The observed knowledge improvement aligns with global tuberculosis prevention strategies that emphasize education as a core component of disease control. The effectiveness of the intervention supports the premise that improving individual knowledge contributes to broader public health protection in high-risk environments. These findings reinforce the importance of health promotion interventions in non-clinical settings where exposure risk remains substantial. The results confirm that booklet media can serve as a practical and impactful tool for tuberculosis education among airport workers. (Craciun et al., 2023)

The improvement in knowledge observed in this study is consistent with evidence from low- and middle-income countries showing that educational interventions significantly influence tuberculosis-related knowledge and awareness. Systematic reviews have demonstrated that insufficient knowledge contributes to delayed diagnosis and ongoing transmission in vulnerable populations. Enhanced understanding of tuberculosis transmission mechanisms is critical given the biological complexity and persistence of Mycobacterium tuberculosis in human hosts. Knowledge gaps regarding disease progression and recurrence may increase susceptibility to reinfection and relapse in high-exposure

environments. Educational interventions targeting these gaps play a crucial role in reducing misinformation and improving preventive behaviors. The findings of this study support the role of targeted education in addressing persistent knowledge deficiencies among working populations (Bigi et al., 2023)

The occupational context of airport workers places them at increased risk of tuberculosis exposure due to frequent interactions with diverse populations. Epidemiological studies have demonstrated that tuberculosis transmission remains elevated in environments characterized by high population movement and dense contact networks. Household and occupational contact investigations have identified working populations as critical targets for preventive interventions. Airport-related occupational groups represent a strategic population for tuberculosis prevention efforts due to their central role in human mobility. Improving knowledge among these workers can reduce transmission risk within transportation hubs and surrounding communities. The current findings emphasize the importance of integrating tuberculosis education into occupational health programs at airports (Kendall et al., 2021)

The regional relevance of this study is underscored by tuberculosis surveillance data from Central Kalimantan, which show persistent disease burden despite high detection rates. Discrepancies between case detection and treatment success indicate that knowledge and behavioral factors remain key challenges in tuberculosis control. Spatial and temporal analyses in Indonesia reveal clustering of tuberculosis cases in areas with high population density and mobility. Environmental and sanitation-related factors further contribute to disease transmission in affected communities. Educational interventions addressing both individual knowledge and environmental awareness may enhance prevention effectiveness. The findings of this study align with regional data highlighting the need for strengthened health education initiatives (BPS Provinsi Kalimantan Tengah, 2024).

The effectiveness of booklet media observed in this study is supported by prior research demonstrating the value of printed educational materials in community health promotion. Booklets provide standardized, accessible, and repeatable information that supports independent learning among adult populations. Health education interventions using simple and clear media have been shown to improve comprehension among individuals with varied educational backgrounds. Printed materials are particularly suitable for occupational settings where time constraints limit formal training opportunities. The success of the booklet intervention in this study reflects its adaptability to real-world workplace environments. These findings support the continued use of booklet-based education as a sustainable strategy for tuberculosis knowledge improvement (Lukita et al., 2025).

Improved tuberculosis knowledge is closely linked to earlier health-seeking behavior and better adherence to prevention and treatment strategies. Studies have shown that individuals with higher tuberculosis knowledge are more likely to recognize symptoms and seek timely medical care. Enhanced understanding of treatment regimens supports adherence and reduces the risk of drug resistance development. Education also plays a critical role in complementing advances in tuberculosis diagnostics and shortened treatment regimens. Integrating educational interventions with biomedical strategies strengthens overall tuberculosis control efforts. The present findings highlight the importance of combining health education with ongoing public health initiatives (Carr et al., 2022).

Despite its strengths, this study has limitations related to its pre-experimental design and accidental sampling technique. The absence of a control group limits causal inference regarding the effectiveness of the intervention. Sampling constraints may reduce the generalizability of findings to other occupational or geographic settings. Nevertheless, pre-experimental designs remain valuable for generating preliminary evidence in restricted or hard-to-access environments. Future studies should consider controlled or quasi-experimental

designs to strengthen evidence quality. Overall, this study contributes meaningful insights into tuberculosis education strategies for airport workers in high-mobility settings (Maulina, 2025).

Conclusion and Recommendation

This study concludes that booklet-based health education effectively improved tuberculosis knowledge among airport workers in a high-mobility occupational setting. The significant increase in post-intervention knowledge scores indicates that structured printed educational media can enhance understanding of tuberculosis transmission, prevention, and control. Improved knowledge among airport workers is particularly important given their frequent interactions with diverse populations and their potential role in interrupting transmission chains. These findings are consistent with global and national tuberculosis control efforts that emphasize health education as a key preventive strategy. The use of booklet media offers a practical, accessible, and sustainable approach for occupational health promotion in settings with limited opportunities for formal training. Therefore, integrating booklet-based tuberculosis education into routine health programs for airport and port workers is recommended to support broader tuberculosis prevention and control initiatives.

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