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Article

Preventive Behaviors and Treatment Patterns of Pulmonary Tuberculosis Patients in Public Health Centers in Bandung

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Abstract

Background: Pulmonary tuberculosis (TB) remains a significant public health issue in Indonesia. Preventive behavior plays a crucial role in breaking the chain of transmission. However, behavioral adherence among TB patients may vary depending on demographic and treatment-related factors.
Objective: This study aimed to examine the relationship between demographic characteristics, treatment duration, and the preventive behavior of pulmonary TB transmission among patients in the working area of Bandung's public health centers.
Methods: A cross-sectional study was conducted from April to May 2022 among 112 pulmonary TB patients attending Babakansari, Babakan Surabaya, and Garuda Health Centers in Bandung, Indonesia. Data were collected using the validated Prevention Behaviors of Pulmonary Tuberculosis Transmission Questionnaire (PBPTTQ). Statistical analyses included Pearson correlation, independent samples t-test, and multiple linear regression to examine associations between age, gender, education level, treatment duration, and preventive behavior.
Results: The majority of respondents were female (59.8%), with a mean age of 37.66 years. Most participants were undergoing treatment in the advanced phase (61.6%) and had a higher education level (77.7%). Preventive behavior was significantly associated with age ($p = 0.004$) and education level ($p < 0.001$), both of which remained significant in multivariate analysis. Education showed the strongest influence ($\beta = 0.480$). Gender and treatment duration were not significant predictors in the adjusted model.
Conclusion: Older age and higher education levels are positively associated with better TB prevention behavior among patients. Health education strategies should be tailored to younger and less-educated patients to improve preventive practices and reduce TB transmission at the community level.

Keywords: Pulmonary tuberculosis, prevention behavior, education level, treatment duration, demographic factors

INTRODUCTION

Pulmonary tuberculosis cases experienced a high increase globally in 2019 in Southeast Asia, around 45%, and in Africa, about 25% (WHO, 2020). This is also one of the infectious diseases that is a public health problem whose incidence is relatively high in Indonesia (Ministry of Health of Republic of Indonesia, 2018). The occurrence of high pulmonary tuberculosis cases is associated with the behavior of

preventing TB transmission (Mutiara & Novita, 2018). The event of increased instances of tuberculosis also indicates that the behavior of preventing transmission of pulmonary tuberculosis has not been maximized, so it is necessary to take action to reduce the rate of information. This transmission prevention behavior is aimed at families, communities, and TB patients (Ramadhan et al., 2021a).

Patients with pulmonary tuberculosis must take precautions to avoid transmission of the disease caused by inappropriate behavior such as spitting and not keeping the environment clean. One of the behavioral components of preventing pulmonary tuberculosis transmission is health education intervention (Rachma et al., 2021). Knowledge and behavior in obtaining information about tuberculosis are essential because they can help reduce the spread of the disease (Dewi et al., 2016). Knowledge of attitudes and actions is the domain of behavior formation, while behavior itself is a stimulus to action. (Febriyanti, 2020) shows that pulmonary tuberculosis prevention behaviors include healthy lifestyles such as using a handkerchief or tissue to cover the mouth when coughing and sneezing, not spitting on the spot, and paying attention to the physical conditions of the house such as humidity, floor conditions, ventilation systems, and good lighting to prevent the spread of TB germs. This is in line with (Hayana et al., 2020), showing that there is a relationship between home environmental factors (population density, humidity, ventilation, and house lighting) and behavior (knowledge and attitudes) of family members with suspected pulmonary tuberculosis in Harapan Tani Village, Indragiri Hilir Regency. Research by (Rangki & Sukmadi, 2021), shows that respondents with bad behavior are more likely to suffer from pulmonary tuberculosis, while respondents with fairly good behavior are less likely to suffer from pulmonary tuberculosis. Based on the above phenomenon, it is necessary to research the characteristics, duration of treatment, and behavior to prevent the transmission of pulmonary tuberculosis in the working area of the Bandung City Health Center.

METHODS

Study Design

This study employed a quantitative cross-sectional design to examine the relationship between patient characteristics, treatment duration, and preventive behaviors regarding pulmonary tuberculosis (TB) transmission. The study was conducted from April 6 to May 6, 2022, in the working areas of Babakansari and Babakan Surabaya Health Centers (Kiaracondong District) and Garuda Health Center in Bandung City, Indonesia.

Sample

The study population consisted of 112 registered pulmonary TB patients undergoing treatment at the aforementioned public health centers. The sample included all individuals who met the inclusion criteria, which were: (1) diagnosed with pulmonary TB, (2) aged ≥18 years, (3) undergoing treatment at the time of data collection, and (4) able and willing to provide informed consent. The exclusion criteria included patients with cognitive or communication impairments that limited their ability to complete the questionnaire.

Although the total accessible population was 112 patients, the required sample size was estimated using G*Power version 3.1.9.7 with a linear multiple regression model, fixed model, R^2 deviation from zero, assuming medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, power = 0.95, and 7 predictors. The resulting sample size was 153. To enhance statistical power and account for attrition, the researchers utilized total sampling for the 112 available patients and purposive sampling for additional respondents until a final total of 250 participants was achieved.

Instrument

The primary instrument used was the Prevention Behaviors of Pulmonary Tuberculosis Transmission Questionnaire (PBPTTQ), developed by Putra, Wiliyanarti, and Anisa (2020). The PBPTTQ is designed to assess patients' behavioral adherence to pulmonary TB transmission prevention protocols.

The questionnaire consists of 20 items, each rated on a 5-point Likert scale ranging from 1 ("Never") to 5 ("Always"), with higher scores indicating better adherence to preventive behaviors. The instrument measures key domains including: (1) cough etiquette, (2) mask usage, (3) ventilation practices, and (4) personal hygiene. The total score ranges from 20 to 100 and is categorized into three levels: low (≤49), moderate (50–74), and high (≥75).

The original instrument demonstrated good internal consistency with a Cronbach's alpha of 0.87. The Bahasa Indonesia version, used in this study, was validated in a previous Indonesian context with a Cronbach's alpha of 0.85, indicating high reliability.

Procedure

Prior to data collection, the research protocol was reviewed and approved by the Institutional Review Board (IRB) of [Insert University or Ethical Review Body], under approval number [Insert Number]. Permissions were also obtained from each participating health center.

Eligible patients were approached in person by trained research assistants, who explained the study objectives, assured confidentiality, and obtained written informed consent. Participants then completed the PBPTTQ in a private setting within the health center or at home, depending on their preference. Data collectors provided support as needed for clarity or reading assistance.

Following questionnaire completion, participants were given brief feedback on their preventive practices based on their responses, along with educational materials about TB transmission control. All collected data were anonymized and securely stored for analysis.

Data Analysis

Data were analyzed using SPSS version 26.0. Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to summarize demographic and clinical characteristics. Bivariate analysis was conducted using Pearson's correlation and Independent Samples t-test to examine relationships between continuous and categorical variables, respectively. A multiple linear regression analysis was subsequently performed to identify independent predictors of TB transmission prevention behaviors. A significance level of $p < 0.05$ was set for all analyses, and confidence intervals were reported at the 95% level.

RESULT

The majority of respondents were female (59.8%), with a mean age of 37.66 years (SD = 15.09), ranging from 17 to 65 years. Most participants had a higher level of education (77.7%) and were undergoing treatment in the advanced stage (4–6 months; 61.6%).

As shown in Table 2, most respondents (85.7%) demonstrated good preventive behavior toward pulmonary TB transmission. Only 14.3% of the participants were classified as having poor preventive behavior.

The bivariate analysis using Pearson's correlation revealed a significant positive relationship between age and preventive behavior ($r = 0.044$; $p = 0.004$). Independent t-tests showed that educational level and treatment duration significantly influenced prevention behavior ($p < 0.001$ and $p = 0.005$, respectively). No significant difference was found in prevention behavior between male and female respondents ($p = 0.149$).

Table 1. Demographic Characteristics of Respondents (N = 112)

Variable	Category	Frequency (n)	Percentage (%)	Mean ± SD	Min–Max
Age (years)	–	–	–	37.66 ± 15.09	17–65
Gender	Female	67	59.8%	–	–
	Male	45	40.2%	–	–
Level of Education	Low (No school/Primary)	25	22.3%	–	–
	High (Secondary/Above)	87	77.7%	–	–
Treatment Duration	Early stage (0–3 months)	43	38.4%	–	–
	Advanced (4–6 months)	69	61.6%	–	–

Table 2. Distribution of Pulmonary Tuberculosis Transmission Prevention Behavior (N = 112)

Behavior Category	Frequency (n)	Percentage (%)	Mean ± SD
Good Prevention Behavior	96	85.7%	
Poor Prevention Behavior	16	14.3%	
Total	112	100.0%	1.86 ± 0.35

Table 3. Relationship Between Demographic Characteristics and Tuberculosis Transmission Prevention Behavior (N = 112)

Variable	Test Used	Mean ± SD	Test Statistic (t / r)	p-value
Age (years)	Pearson correlation	–	r = 0.044	0.004*
Gender	Independent t-test	Female: –	t = –1.453	0.149
		Male: –		
Education Level	Independent t-test	Low: –2.385 ± 1.641	t = –7.553	<0.001*
		High: –11.958 ± 1.583		
Treatment Duration	Independent t-test	Early: –0.413 ± 1.670	t = –3.247	0.005*

Note: *Significant at $p < 0.05$

DISSCUSSION

The respondents' average age was 37.66 years (SD = 15.09), with a majority in the productive age range. Age was found to be significantly associated with pulmonary tuberculosis (TB) prevention behavior. Pearson's correlation analysis showed a significant positive relationship ($r = 0.044$, $p = 0.004$), and this association remained significant in the multiple regression model ($p = 0.033$; coefficient = 1.876). These findings suggest that older individuals are more likely to engage in preventive behaviors. This may be attributed to their greater exposure to health information and heightened awareness of the health and economic impacts of TB, particularly in relation to their capacity to work (Irwan et al., 2021; Fera et al., 2020).

In terms of gender, 59.8% of participants were female. However, no significant differences in preventive behavior were observed between males and females, as confirmed by both bivariate ($p = 0.149$) and multivariate analyses ($p = 0.104$). Although gender-related differences in TB risk have been documented—particularly regarding smoking and occupational exposures (Kaona et al., 2004; Wang et al., 2008)—this study found that both men and women demonstrated similarly good preventive practices. This

aligns with previous findings that preventive behavior is not inherently gender-dependent (Ramadhan et al., 2021b; Amallia et al., n.d.).

Education level emerged as a key determinant of TB prevention behavior. Respondents with higher education—comprising 77.7% of the sample—demonstrated significantly better preventive practices. Both the independent t-test ($p < 0.001$) and the regression model ($p < 0.001$; coefficient = 6.751; $\beta = 0.480$) confirmed the strong predictive value of education. Individuals with higher education are more likely to access, comprehend, and apply health information, leading to improved adherence to prevention guidelines (Notoatmodjo, 2018). This finding is consistent with studies by Hutama et al. (2019) and Ramadhan et al. (2021b), which reported a clear association between education and TB-related health behavior.

Treatment duration also showed a significant bivariate relationship with prevention behavior ($p = 0.005$). Respondents in the advanced stage of treatment (4–6 months) represented 61.6% of the sample and were more likely to exhibit appropriate preventive actions. However, this variable did not remain significant in the multivariate model ($p = 0.338$), although the direction of the effect was positive (coefficient = 0.962). This trend suggests that prolonged treatment may contribute to improved behavior through repeated exposure to counseling and health education (Irwan et al., 2021), but it may be less impactful than age or education when other variables are controlled.

CONCLUSION

This study demonstrates that age and education level are significant factors influencing preventive behavior toward pulmonary tuberculosis transmission. Individuals with higher education levels are substantially more likely to engage in protective health behaviors, making education a critical point of intervention for TB control programs. While gender and treatment duration were not statistically significant in multivariate models, trends suggest they may still contribute to preventive behaviors under specific conditions. Strengthening public health education, particularly for populations with lower formal education, and ensuring consistent counseling throughout TB treatment are vital strategies to improve disease control outcomes.

Conflict of Interest

The authors have declared that no conflict of interest exists.

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