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KNOWLEDGE AND BEHAVIOR TO PREVENT PULMONARY TUBERCULOSIS TRANSMISSION

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Abstract

Indonesia continues to face major challenges in controlling pulmonary tuberculosis (TB) transmission, with high rates of new cases often linked to inadequate prevention practices such as poor mask compliance, lack of cough etiquette, and insufficient household ventilation, which significantly increase transmission risk within families. This study aimed to analyze the relationship between knowledge and behavior in preventing pulmonary TB transmission at the Kaliwungu Community Health Center. A cross-sectional descriptive design was used with purposive sampling, involving 57 respondents who met the inclusion criteria: patients who tested positive for pulmonary TB, were registered at the Kaliwungu Community Health Center, resided in Kaliwungu District, were aged ≥18 years, and fully conscious during data collection. Exclusion criteria were patients who had recovered, those with TB-HIV or MDR-TB, and respondents who did not complete the questionnaire correctly. Data were collected using a structured questionnaire on TB knowledge and prevention behaviors, then analyzed using univariate analysis and chi-square tests for bivariate analysis. The results revealed a significant relationship between knowledge and prevention behavior (p=0.009; OR=6.000), indicating that respondents with higher knowledge were six times more likely to engage in preventive actions compared to those with lower knowledge. These findings emphasize the critical role of patient knowledge in shaping behavior, suggesting that improving health literacy about pulmonary TB can directly strengthen prevention practices. In conclusion, the study demonstrates a significant association between knowledge and prevention behaviors, highlighting the need for targeted educational interventions to reduce TB transmission at the community level..

I. INTRODUCTION

Pulmonary tuberculosis (TB) remains a global problem. In 2022, approximately 10.6 million people were infected with TB, comprising 5.8 million men, 3.5 million women, and 1.3 million children (World Health Organization, 2023). In the United States, in 2021, the CDC reported 7,882 cases of TB. These 2,834,834 cases, or 36%, occurred in Asians, representing a rate of 14.4 cases per 100,000 people (Centers for Disease Control and Prevention, 2022). In 2022, Indonesia ranked second after India in the number of tuberculosis (TB) cases, with 969,000 cases. The productive age group, particularly those aged 45 to 54, was the most affected by TB (Ministry of Health of the Republic of Indonesia, 2023). In Central Java, the Notified Tuberculosis (TB) Case Detection Rate (CNR) was 113.8 per 100,000 population, with a total of 42,148 cases (Central Java Provincial Health Office, 2022).

Kudus Regency recorded a CNR of 185.2 per 100,000 population, indicating a high TB incidence rate (Central Java Provincial Health Office, 2022). The Kaliwungu Community Health Center in Kudus Regency faces serious challenges, with 89 TB cases in 2021, consisting of 46 cases in men and 43 in

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women. The Rejosari and Wergu Wetan Community Health Centers recorded the lowest number of cases, with 14 cases each (Kudus Regency Health Office, 2021). Globally, TB killed 1.3 million people in 2022, including 167,000 people who were also infected with HIV. TB is the second leading cause of infectious death after COVID-19 (World Health Organization, 2023). In Indonesia, deaths from pulmonary TB reach 93,000 per year, or approximately 11 deaths every hour (Ministry of Health of the Republic of Indonesia, 2023).

In Central Java, there were 1,872 deaths from TB in 2022 (Ministry of Health of the Republic of Indonesia, 2023b). In Kudus Regency, 69 deaths from pulmonary TB were recorded (Kudus, 2022). However, at the Kaliwungu Community Health Center, there were no deaths from TB because all detected patients were treated according to existing treatment standards, thus preventing death. Preventive measures for tuberculosis prevention include a clean lifestyle, covering the mouth when coughing, avoiding spitting carelessly, isolating patient equipment, and opening windows every morning (Sari et al., 2020). The causes of pulmonary TB problems studied are often associated with non-compliance with transmission prevention measures and a lack of patient knowledge. Research shows that patients' low level of knowledge about TB contributes to their non-compliance with preventive procedures (Kazaura & Kamazima, 2021). If this problem is not addressed, the impact will be very serious. Increased TB transmission will lead to higher morbidity and mortality rates, ultimately burdening the national health system. Furthermore, the uncontrolled spread of TB can lead to the emergence of more drug-resistant strains of TB, complicating disease control efforts. This study is novel in its approach by focusing on factors related to TB transmission prevention behaviors among patients. This differs from previous studies that have focused more on the clinical and treatment aspects of TB. Thus, this study is expected to make a significant contribution to the understanding of factors influencing TB prevention behavior and assist in the development of more effective intervention strategies.

Knowledge is information obtained through sensory experiences, such as hearing and sight, which plays a crucial role in shaping Tuberculosis (TB) prevention measures. Knowledge influences decisions about seeking medical care. The greater an individual's knowledge of the impact of the disease, the more likely they are to take preventive measures (Pakpahan et al., 2021). Preventive behavior based on knowledge is more consistent and sustainable. According to Rogers (1974), the behavioral adoption process involves awareness, interest, assessment, trial, and adaptation. However, behavior without a strong foundation of knowledge and awareness will not be sustainable (Mahendra et al., 2019). The results of a preliminary study conducted on Monday, November 27, 2023, at the Kaliwungu Community Health Center in Kudus Regency, through interviews with TB Polytechnic Officers, showed that the Kaliwungu Community Health Center has the highest number of pulmonary TB patients in Kudus Regency. Based on available data, the number of cases of pulmonary tuberculosis at the Kaliwungu Community Health Center in 2021 was recorded at 89, with 46 cases in men and 43 cases in women.

A preliminary study of the transmission prevention behavior of TB patients in this area indicates that many patients have not optimally implemented preventive measures. For example, some patients still do not always cover their mouths when coughing, spit carelessly, and ignore the importance of good ventilation at home. Furthermore, non-compliance with mask use and isolation of eating utensils is also frequently found. This indicates the need for more effective interventions to improve patient knowledge and compliance in implementing TB transmission prevention procedures in order to prevent an increase in cases and further impact of this disease. Furthermore, based on interviews and documentation review with five respondents suffering from pulmonary tuberculosis on Thursday, November 30, 2023, it was found that respondents

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understood that TB is an infectious disease that can be detected through sputum examination.

This research is expected to have important implications for the development of nursing science and the nursing profession. The findings can be used as a basis for designing educational and training programs for nurses, particularly in educating patients about the importance of preventing TB transmission. Furthermore, the results of this study can also assist policymakers in formulating better health policies for TB control. The aim of this study was to analyze the relationship between patient knowledge and behavior in preventing the transmission of pulmonary tuberculosis.

II. METHODS

This research is quantitative with a descriptive approach. Quantitative research is defined as an effort to investigate problems using numerical data. In this study, researchers collect and analyze data based on statistically measured variables. The purpose of quantitative research is to assist decision-making, describe accurate theoretical predictions, and develop mathematical models. This research also aims to determine the relationship between variables in a population through measurable, rational, and systematic methods (Amruddin et al., 2022). Descriptive research methods aim to systematically and accurately describe facts or characteristics of a population, combine information, and organize data (Nurdin & Hartati, 2019). In this study, researchers will examine whether there is a relationship between knowledge in pulmonary tuberculosis patients and the incidence of pulmonary tuberculosis transmission prevention behavior. In this study, the independent variable is knowledge. In this study, the dependent variable is the pulmonary tuberculosis patient's transmission prevention behavior.

This research was conducted using the *cross-sectional study.* This study uses a cross-sectional method *(cross sectional study)* to evaluate disease prevalence and risk factors simultaneously. The goal is to observe the relationship between risk factors and specific outcomes over the same period (Noor & Arsin, 2022). This method is used to observe disease behavior. The study focused on preventing transmission in tuberculosis patients, not the incidence of the disease. This study tested hypotheses with independent and dependent variables observed simultaneously. Data were collected by measuring knowledge and behavior related to preventing pulmonary tuberculosis transmission. This research was conducted in March 2024 at the Kaliwungu Community Health Center, Kudus Regency.

Populasi dalam penelitian ini adalah pasien TBC Paru sebanyak 67 pasien di The population in this study was 67 pulmonary tuberculosis patients at the Kaliwungu Community Health Center. The sample size was 57 respondents. Total sampling was used, with the sample size equal to the population size. The study employed a non-probability sampling technique with a sample size of 57 respondents. *purposive sampling*, which is a method that selects samples based on specific considerations or specific objectives (Ahmad et al., 2023). Researchers selected samples based on inclusion and exclusion criteria that had been determined by the researcher. Inclusion criteria included pulmonary tuberculosis patients registered at the Kaliwungu Community Health Center, living in Kaliwungu District, aged ≥ 18 years, and fully conscious at the time of the study. Exclusion criteria included patients who had recovered, TB-HIV and MDR-TB patients, and respondents who refused or did not complete the questionnaire correctly. The research instrument was a questionnaire modified from the research of Humaira (2013) and Sumiati Astuti (2013) in Ramadhani (2021), with the results of the validity test indicating that the questions in the questionnaire were valid, with a validity value above the r table value of 0.361. The reliability test showed a value of 0.737 with an r table of 0.60, so the instrument was declared reliable, indicating that the instrument used had a good level of reliability. The research procedure includes

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submitting a research proposal to obtain a recommendation from the Head of the Study Program, processing a research permit from Kesbangpol and the Kudus Regency Health Office, and obtaining permission from the Director of the Kaliwungu Community Health Center. After obtaining the research permit, the researcher determined potential respondents based on data on pulmonary TB patients at the Kaliwungu Community Health Center's TB Clinic and collected data through questionnaires distributed to respondents accompanied by TB Clinic officers. The collected data were analyzed using bivariate analysis to determine the relationship between knowledge and transmission prevention behavior in pulmonary TB patients at the Kaliwungu Community Health Center. The data analysis used was *chi-square*. *This* technique is used to test the relationship between categorical variables in a contingency table. If the p-value is <0.05, there is a significant relationship between the independent and dependent variables. Conversely, if the p-value is >0.05, there is no significant relationship between the independent and dependent variables. This technique is suitable for use because it is easy to interpret and can provide reliable results with a 95% confidence level, and the results of the study are used to test hypotheses.This research also ensures the code of research ethics by ensuring several important aspects: research approval (*informed consent*) was given to potential respondents who met the inclusion criteria, anonymity was maintained by not including the respondents' real names but using initials or special codes, and confidentiality of information was guaranteed by only reporting data in group form. In addition, this research has been declared to have passed ethical review by the Research Ethics Committee with Number 71/Z-7/KEPK/UMKU/XI/2024, dated November 2024, to guarantee protection of the rights and welfare of respondents.

III. RESULTS AND DISCUSSION

A. Respondent Characteristics

Based on the results of research conducted at the Kaliwungu Community Health Center in Kudus Regency, the characteristics of the respondents can be described as follows:

Table 1. Frequency Distribution of Respondent Characteristics Based on Age (n = 57)

Variable	Mean	Std. Deviasi	Min–max
Age (years)	44.18	10.672	22–66

Source: Primary Data 2024

Based on Table 1 above, it is known that of the 57 respondents with pulmonary tuberculosis at the Kaliwungu Community Health Center, the average age of respondents was 44.18, with a standard deviation of 10.672. The youngest was 22 years old, and the oldest was 66 years old.

Table 2. Frequency Distribution of Respondent Characteristics Based on Gender (n= 57)

Gender	f	%
Man	24	42.1
Woman	33	57.9
Total	**57**	**100**

Source: Primary Data 2024

Based on table 2, it shows that of the 57 respondents, there were pulmonary TB patients at the Kaliwungu Health Center. The majority frequency of gender is female, with as many as 33 respondents (57.9%).

Knowledge

Table 3. Frequency Distribution of Respondents Based on Knowledge at Kaliwungu Community Health Center, Kudus Regency (n= 57)

Knowledge	f	%
Low	16	28.1
High	41	71.9
Total	**57**	**100**

Source: Primary Data 2024

Based on table 3 above, the frequency distribution based on knowledge at the Kaliwungu Community Health Center, Kudus Regency, most respondents had high knowledge regarding behavior to prevent transmission of pulmonary tuberculosis, as many as 41 respondents (71.9%).

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B. Prevention Behavior of Pulmonary TB Patients

Table 4. Transmission Prevention Behavior of Pulmonary TB Patients at the Kaliwungu Community Health Center, Kudus Regency (n= 57)

Prevention Behavior of Pulmonary TB Patients	f	%
Bad	22	38.6
Good	35	61.4
Total	**57**	**100**

Source: Primary Data 2024

Based on table 4, it shows that the frequency of the majority of the behavior of preventing transmission of pulmonary TB patients is good, as many as 35 respondents (61.4%), while the frequency of the minority of the behavior of preventing transmission of pulmonary TB patients is bad, as many as 22 respondents (38.6%).

The Relationship Between Knowledge and Behavior in Preventing Pulmonary Tuberculosis Transmission at the Kaliwungu Community Health Center, Kudus Regency

Table 5. The Relationship between Knowledge and Behavior in Preventing Pulmonary Tuberculosis Transmission at the Kaliwungu Community Health Center, Kudus Regency (n = 57)

	Prevention Behavior of Pulmonary TB Patients				
Knowledge	**Bad**	**Good**	**Total**	**Asymptotic Significance (2-sided)**	**Odds Ratio (OR)**
Low	11 (6.2%)	5 (9.8%)	16 (16.0%)	0.009	6.000
High	11 (15.8%)	30 (25.2%)	41 (41.0%)		
Total	22 (22.0%)	35 (35.0%)	57 (57.0%)		

Source: Primary Data 2024

Based on table 5, the results of the study show that of the 57 respondents studied, there were 11 (6.2%) respondents with low knowledge and a poor category of prevention behavior for pulmonary TB transmission, 11 (15.8%) respondents with high knowledge and a poor category of prevention behavior for pulmonary TB transmission, 5 (9.8%) respondents with low knowledge and a good category of prevention behavior for pulmonary TB transmission, and 30 (25.2%) respondents with high knowledge and a good category of prevention behavior for pulmonary TB transmission. From the results of the statistical analysis of the test, which obtained a p-value of 0.009 with an OR value of 6,000, it can be concluded that there is a relationship between knowledge and the behavior of preventing transmission of pulmonary tuberculosis patients at the Kaliwungu Community Health Center, Kudus Regency, and an OR value of 6,000 is obtained, meaning that respondents with high knowledge will have a 6 times greater chance of preventing transmission of pulmonary tuberculosis compared to respondents with low knowledge.

In addition, the value obtained was also Asymp. *Sig. (2-tailed) = 0.009*, which means that the relationship between knowledge and the behavior of preventing transmission of pulmonary TB patients is very strong.

Knowledge

Based on the results of the study, it shows that the majority of knowledge categories are high, namely 41 respondents (71.9%), and 16 respondents (28.1%) have low knowledge categories. Based on the table, it can be concluded that of the 57 respondents, 41 respondents (71.9%) have high knowledge categories and 16 respondents (28.1%) have low knowledge categories. Based on the table, it can be concluded that the number of respondents with high knowledge categories is greater than the number of respondents with low knowledge categories.

Good knowledge about a disease and how to prevent it is a crucial factor in developing positive health behaviors (Safaruddin & Muhammad Aris, 2023). Adequate knowledge enables individuals to understand the importance of preventive measures and the risks associated with TB transmission. According to cognitive theory, high levels of knowledge will influence a person's attitudes and beliefs about a behavior, which will

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ultimately influence their decisions to take preventive measures (Yanuardianto, 2019). Other research also suggests that increasing public health knowledge can contribute to reducing the rate of infectious disease transmission (Hasudungan & Wulandari, 2020).

C. Prevention Behavior of Pulmonary TB Patients

Based on the results of the study, it shows that the majority of respondents have a good category of prevention behavior for pulmonary tuberculosis transmission, namely 35 respondents (61.4%), and 22 respondents (38.6%) have a bad category of prevention behavior for pulmonary tuberculosis transmission. Based on the table, it can be concluded that the number of respondents with a good category of prevention behavior for pulmonary tuberculosis transmission is greater than the number of respondents with a bad category of prevention behavior for pulmonary tuberculosis transmission.

Good preventive behavior can be influenced by various factors, including knowledge, motivation, and environmental support. According to health behavior theory, a person's behavior is strongly influenced by their perception of the risks and benefits of health measures. In the context of tuberculosis (TB), a strong perception of the risk of transmission can encourage a person to be more compliant in carrying out preventive measures. Furthermore, support from family and the surrounding environment also plays a crucial role in shaping good behaviors in preventing pulmonary TB transmission (Widiharti et al., 2022). These results align with previous research showing that social support and health education contribute significantly to improving behaviors to prevent infectious disease transmission (Dilas et al., 2023).

The Relationship Between Knowledge and Behavior in Preventing Pulmonary Tuberculosis Transmission at the Kaliwungu Community Health Center, Kudus Regency

Based on the table above, it can be concluded that of the 57 respondents, some respondents had high knowledge, namely 41 people (41.0%), and a small number of respondents had low knowledge, namely 16 people (16.0%). From this data, it can be concluded that more than half of the respondents had high knowledge, and the rest had low knowledge.

The results of the study obtained from computer data using SPSS from a total of 57 respondents showed that there were 11 (6.2%) respondents with low knowledge and behavior to prevent transmission of pulmonary tuberculosis in the bad category, 11 (15.8%) respondents with high knowledge and behavior to prevent transmission of pulmonary tuberculosis in the bad category, 5 (9.8%) respondents with low knowledge and behavior to prevent transmission of pulmonary tuberculosis in the good category, and 30 (25.2%) respondents with high knowledge and behavior to prevent transmission of pulmonary tuberculosis in the good category.

After cross tabulation is carried out, analysis is carried out using statistical tests. *Chi-square tests* and the p-value $<\alpha$ (<0.05) were obtained so that H_0 was rejected and Ha was accepted. So it can be concluded that there is a relationship between knowledge and the behavior of preventing transmission of pulmonary tuberculosis patients at the Kaliwungu Community Health Center, Kudus Regency. In addition, the P value was also obtained as *Asymp. Sig. (2-tailed) = 0.009*, which means that the relationship between knowledge and the behavior of preventing transmission of pulmonary TB patients is very strong.

Good health literacy is associated with better protective behaviors, such as wearing masks and maintaining social distancing. It also increases readiness to take preventive measures and encourages individuals to seek further information about infectious diseases, which in turn can improve efforts to prevent and control the spread of the disease (Uribe et al., 2021). Based on the results of this study, it can be seen that the majority of pulmonary tuberculosis patients at the

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Kaliwungu Community Health Center in Kudus Regency have a high level of knowledge (71.9%). These results are consistent with the results of research conducted by Jehaman (2021), which found that respondents with good knowledge were higher than those with low knowledge, at 63.6%.

Knowledge plays a crucial role in influencing preventive behavior, as explained in behavior formation theory. According to Glanz et al. (2024), adequate knowledge about a disease enables individuals to understand the risks and importance of preventive measures, which in turn shapes positive attitudes and preventive behavior. Good knowledge enables individuals to undertake more effective and sustainable preventive measures.

The results of this study align with research by Napitupulu & Ahmad (2021), which showed that respondents with good knowledge were more active in preventive measures. Research by Listyarini & Heristiana (2021) also confirmed that higher levels of knowledge were positively correlated with more active tuberculosis prevention measures. Research by Hidayah (2022) also supports these findings by showing that respondents with good knowledge tend to practice prevention better than those with less knowledge. Good knowledge increases awareness and understanding of proper preventive measures, such as cough etiquette and personal hygiene, which are crucial in preventing pulmonary tuberculosis.

This research aligns with Jehaman's (2021) study, which confirmed that higher levels of knowledge correlate with more active TB prevention measures. In this context, respondents' knowledge plays a central role in shaping behavior. This is supported by research by Rahmadhani et al. (2023), which found a significant relationship between knowledge levels and TB transmission prevention. Thus, knowledge plays a crucial role in shaping preventive behavior because it provides the information necessary to make better preventive decisions. Community health centers are expected to continue improving public knowledge about pulmonary TB through effective educational programs based on behavioral theory and the latest research findings.

Limitations of this study include potential bias due to the influence of family members on respondents' answers, difficulties of elderly respondents in completing the questionnaire, requiring interviews for data collection, an adequate sample size but may be more representative with a larger population and sample, and limited literature references relevant to the research title.

IV. CONCLUSION

There is a significant relationship between knowledge (p value with value Asymp. Sig. (2-tailed) = 0.009) and the transmission prevention behavior of pulmonary TB patients at the Kaliwungu Community Health Center, Kudus Regency. The Kaliwungu Community Health Center needs to increase its educational efforts regarding pulmonary TB prevention by strengthening its outreach program and ensuring that educational materials are easily understood by patients. Furthermore, the Community Health Center should conduct regular evaluations to measure the effectiveness of its outreach program and adjust its educational strategy based on the results of this study to address knowledge gaps and improve patient adherence to pulmonary TB prevention.

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