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Factors Associated with Pulmonary Tuberculosis Transmission Prevention in Jorong Subarang, Solok Regency

Dessy Fetryati Sari[1]
[1] Public Health Study Program, Universitas Fort De Kock Bukittinggi, Indonesia
e-mail: dessy_fetryati@yahoo.co.id

ABSTRACT

Abstract: Background: Pulmonary tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis, and it spreads faster in enclosed air, such as the stuffy and humid air inside houses. This study aimed to determine the relationship of knowledge, residential density, and the role of health workers with the prevention of pulmonary TB transmission in Jorong Subarang, in the working area of Selayo Health Center. **Methods:** This descriptive analytic study used a cross-sectional approach and was conducted from 21 July to 10 August 2025. The population was 1,227 households in Jorong Subarang, Nagari Koto Baru, and 93 households were selected by systematic random sampling. Data were analyzed with univariate analysis and bivariate analysis using the Chi-square test. **Results:** Of 93 respondents, 65 (69.9%) did not practice prevention of pulmonary TB transmission. Prevention was significantly associated with knowledge (p = 0.005; OR = 4.050), residential density (p = 0.019; OR = 3.467), and the role of health workers (p = 0.003; OR = 4.565). **Conclusion:** Knowledge, residential density, and the role of health workers were associated with the prevention of pulmonary TB transmission. Health workers are expected to provide regular counseling so that the community receives information on the impact of the disease.

Keywords: *residential density; knowledge; tuberculosis; health workers*

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Introduction

Background

Pulmonary tuberculosis (TB) is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*. The source of transmission is a TB patient with positive acid-fast bacilli (AFB) sputum, who spreads the bacteria through sputum droplets. Patients with negative AFB can also transmit the disease, although at a lower rate (Kementerian Kesehatan RI, 2020).

Tuberculosis remains a global concern. According to the World Health Organization (2013), Indonesia ranked third in the number of TB cases after India and China, with about 700,000 cases. In 2014, TB was estimated to affect 9.6 million people and cause 1.2 million deaths, and India, Indonesia, and China accounted for 23%, 10%, and 10% of all patients worldwide, respectively

(World Health Organization, 2020). Almost all ASEAN countries are among the 22 countries with the highest TB burden, except Singapore and Malaysia (Najmah, 2016).

In Indonesia, 330,910 TB cases were found in 2015, compared with 324,539 in 2014. West Java, East Java, and Central Java reported the highest numbers, together 38% of all new cases (Kementerian Kesehatan RI, 2015). In West Sumatra, the new-case detection coverage rose from 87.17% in 2011 to 137.84% in 2015 (Dinas Kesehatan Provinsi Sumatera Barat, 2015). In Solok Regency, pulmonary TB cases detected numbered 228 in 2014, 227 in 2015, and 243 in 2016, and Selayo Health Center was among the health centers with the highest case detection of the 18 in the regency (Dinas Kesehatan Kabupaten Solok, 2016).

At Selayo Health Center, located in Kubung District, 26 cases (61.33%) were found in 2014, 29 cases (67.37%) in 2015, and 43 cases (98.89%) in 2016. Although the number of cases rose each year, screening of TB suspects was far below target: 201 suspects were found in 2015 and 185 in 2016, against a target of 700 each year. The working area covers 43,043 people in 10,868 households.

Literature Review

Knowledge is an important domain in shaping a person's actions, and behavior based on knowledge tends to last longer. Previous studies reported significant relationships between knowledge and TB transmission prevention behavior (Noviati, 2013; $p = 0.008$) and between residential density and pulmonary TB (Kurniasih, 2016, $p = 0.023$, OR = 3.314; Mawardi, 2014, $p = 0.006$). The Ministry of Health requires a bedroom floor area of at least 10 m^2 per person and recommends that no more than two people sleep in one bedroom, except children under two years. The role of health workers has also been linked to TB control practice: Widjanarko (2006) found a significant relationship ($p = 0.001$) between health workers and the practice of finding TB suspects.

Research Gap

Case detection at Selayo Health Center is rising, yet suspect screening remains far below target, which suggests that prevention in the community needs attention. We found no study of the factors related to TB transmission prevention in Jorong Subarang, so the local contribution of knowledge, residential density, and health worker role was unknown.

Novelty and Rationale of the Study

This study examines three factors together, one individual factor (knowledge), one environmental factor (residential density), and one service factor (the role of health workers), in a community within the working area of a health center with high TB case detection. The results can guide health workers in focusing prevention efforts.

Research Objectives

The study aimed to determine the relationship of knowledge, residential density, and the role of health workers with the prevention of pulmonary TB transmission in Jorong Subarang, Nagari Koto Baru, in the working area of Selayo Health Center, Solok Regency, in 2025.

Methods

Study Design

This quantitative study used a cross-sectional approach, in which the dependent and independent variables were measured at the same time, to examine the relationship of knowledge, residential density, and the role of health workers with pulmonary TB prevention.

Research Location and Timeline

The study was conducted in Jorong Subarang, Nagari Koto Baru, in the working area of Selayo Health Center, Solok Regency, from 21 July to 10 August 2025.

Population and Sampling Technique

The population was all 1,227 households in Jorong Subarang. A sample of 93 households was drawn by systematic random sampling.

Data Collection Procedures and Instruments

Data were collected by interviews using a questionnaire and by direct observation.

Statistical Analysis

Data were analyzed with univariate analysis and bivariate analysis using the Chi-square test. Associations are reported with p-values and odds ratios (OR) with 95% confidence intervals (CI).

Scope and/or Limitations of the Methodology Used

The study covered three factors in one jorong. The cross-sectional design measures variables at one point in time, and only bivariate analysis was performed.

Results and Discussion

Results

Univariate results

Of 93 respondents, 65 (69.9%) did not practice prevention of pulmonary TB transmission. More than half had low knowledge (59.1%), most lived in housing that did not meet the density requirement (72.0%), and more than half reported a poor role of health workers (53.8%) (Table 1).

Table 1. *Distribution of respondents (n = 93)*

Variable	n	%
Prevention of pulmonary TB transmission		
Not practicing prevention	65	69.9
Practicing prevention	28	30.1
Knowledge		
Low	55	59.1
High	38	40.9
Residential density		
Does not meet the requirement	67	72.0
Meets the requirement	26	28.0
Role of health workers		
Poor	50	53.8
Good	43	46.2

Knowledge and prevention

Among 55 respondents with low knowledge, 45 (81.8%) did not practice prevention, compared with 20 of 38 respondents (52.6%) with high knowledge. The relationship was significant (p = 0.005), and the odds of not practicing prevention were 4.050 times higher among respondents with low knowledge (95% CI 1.589–10.320) (Table 2).

Table 2. *Relationship between knowledge and prevention of pulmonary TB transmission*

Category	Not preventing, n	%	Preventing, n	%	Total, n	%	p-value	OR (95% CI)
Low	45	81.8	10	18.2	55	100	0.005	4.050 (1.589–10.320)
High	20	52.6	18	47.4	38	100		
Total	65	69.9	28	30.1	93	100		

Note. Chi-square test; OR for not practicing prevention (reference: high knowledge, density meeting the requirement, good role).

Residential density and prevention

Among 67 respondents whose housing did not meet the density requirement, 52 (77.6%) did not practice prevention, compared with 13 of 26 (50.0%) whose housing met it. The relationship was significant (p = 0.019), with 3.467 times higher odds of not practicing prevention in dense housing (95% CI 1.328–9.051) (Table 3).

Table 3. *Relationship between residential density and prevention of pulmonary TB transmission*

Category	Not preventing, n	%	Preventing, n	%	Total, n	%	p-value	OR (95% CI)
Does not meet the requirement	52	77.6	15	22.4	67	100	0.019	3.467 (1.328–9.051)
Meets the requirement	13	50.0	13	50.0	26	100		
Total	65	69.9	28	30.1	93	100		

Note. Chi-square test; OR for not practicing prevention (reference: high knowledge, density meeting the requirement, good role).

Role of health workers and prevention

Among 50 respondents who reported a poor role of health workers, 42 (84.0%) did not practice prevention, compared with 23 of 43 (53.5%) who reported a good role. The relationship was significant (p = 0.003), with 4.565 times higher odds of not practicing prevention when the role was poor (95% CI 1.740–11.980) (Table 4).

Table 4. *Relationship between the role of health workers and prevention of pulmonary TB transmission*

Category	Not preventing, n	%	Preventing, n	%	Total, n	%	p-value	OR (95% CI)
Poor	42	84.0	8	16.0	50	100	0.003	4.565 (1.740–11.980)
Good	23	53.5	20	46.5	43	100		
Total	65	69.9	28	30.1	93	100		

Note. Chi-square test; OR for not practicing prevention (reference: high knowledge, density meeting the requirement, good role).

Discussion

Knowledge

Knowledge was significantly related to prevention, consistent with Noviati (2013), who reported p = 0.008 between knowledge and TB transmission prevention behavior. The authors assume that respondents with high knowledge are aware of the danger of TB and act accordingly on what they learned from print media, electronic media, or health workers, whereas respondents with low knowledge do not know how to prevent TB because they do not know its danger. Behavior is not formed by knowledge alone, however, and many complex factors also influence it.

Residential density

Residential density was significantly related to prevention. Residential density is the ratio of house floor area to the number of household members. The more people occupy a room, the faster the indoor air becomes polluted and the more bacteria are present in the air, so housing that does not meet the density requirement can contribute to TB. The finding is in line with Kurniasih (2016), who reported p = 0.023 and OR = 3.314 for density and pulmonary TB, and with Mawardi (2014), who reported p = 0.006. The authors assume that crowded houses make disease transmission easier, so households in dense housing are more exposed than those in less dense housing.

Role of health workers

The role of health workers was significantly related to prevention. Health workers are people who devote themselves to health and have the knowledge and skills gained through health education, in line with Law No. 36 of 2014 (Suharti, 2014). The result is consistent with Widjanarko (2006), who found a significant relationship (p = 0.001) between health workers and the practice of finding TB suspects. The authors assume that the relationship is related to a lack of motivation among workers to inform the community and change its behavior. Prevention should precede eradication, and workers' role strongly influences community behavior, for example through counseling at set intervals, outreach on infectious diseases, and forming village cadres.

Implications

Prevention of TB transmission in the area is low (69.9% did not practice it), and all three factors are modifiable through counseling, health worker engagement, and attention to housing conditions.

Research Contribution

The study provides local evidence from Jorong Subarang on three factors related to TB transmission prevention, with odds ratios that health workers can use to set priorities.

Limitations

The cross-sectional design cannot establish causality, only one jorong was studied, and only bivariate analysis was used, so confounding was not controlled.

Suggestions

The community should increase knowledge, understanding, and awareness of pulmonary TB by attending counseling by health workers more intensively. Health center staff should improve human resource quality through routine health counseling on TB, hold prevention outreach with the community at the village hall at least once a month, and encourage regular treatment to avoid additional cases. Other researchers can extend this study to more locations and include patients who are still under TB treatment.

Conclusion

Most respondents (69.9%) did not practice prevention of pulmonary TB transmission. Knowledge (p = 0.005; OR = 4.050), residential density (p = 0.019; OR = 3.467), and the role of health workers (p = 0.003; OR = 4.565) were significantly related to prevention. Health workers are encouraged to provide regular counseling so that people understand the impact of the disease and take preventive action.

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