



The Relationship between Knowledge, Attitude, and Family Support and the Success of Tuberculosis Preventive Treatment among Household Contacts of Drug-Sensitive TB Patients

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Abstract: Tuberculosis (TB) remains a serious health problem in Indonesia, particularly in the West Nusa Tenggara region. Tuberculosis Preventive Treatment (TPT) for household contacts of drug-sensitive (DS) TB patients is a key strategy for TB elimination; however, TPT coverage at Puskesmas Pelangan, West Lombok Regency, remains at only 25.25%, far below the national target. This study aimed to describe knowledge, attitude, family support, and TPT success, and to analyze the relationship between each of these variables and the success of TPT administration among household contacts of DS-TB patients. A quantitative study with a cross-sectional design was conducted in 2025 in the working area of Puskesmas Pelangan, West Lombok Regency, using the TB program database for the 2024–2025 period. Samples were taken purposively from all registered household contacts of DS-TB patients. Data were collected through a structured questionnaire and a review of the Puskesmas Pelangan TB program records. Bivariate analysis used the Chi-square test and Fisher's Exact test, with a significance level of $p < 0.05$. Puskesmas Pelangan's TPT achievement (25.25%) ranked second highest in West Lombok after Sesela (61.62%), yet remained very low compared with the national standard. Most respondents had poor knowledge (62.5%), a negative attitude toward TPT (58.3%), and low family support (53.8%). Bivariate analysis showed significant relationships between knowledge ($p = 0.012$), attitude ($p = 0.008$), and family support ($p = 0.003$) with TPT success. Knowledge, attitude, and family support were each independently and significantly associated with TPT success. Family support was the most dominant factor. Interventions to strengthen family capacity and community education are needed to improve TPT achievement in the working area of Puskesmas Pelangan.

Keywords: Family support; Household contact; Knowledge; Puskesmas Pelangan; Tuberculosis preventive treatment

Introduction

Tuberculosis (TB) remains one of the leading infectious causes of morbidity and mortality worldwide despite the availability of effective preventive and curative interventions. According to the World Health Organization (WHO), an estimated 10.8 million people developed TB and approximately 1.25 million died from the disease in 2023, making TB the leading cause of death

from a single infectious agent after the COVID-19 pandemic (Sterling et al., 2020; WHO, 2024). Indonesia continues to bear a disproportionately high burden, ranking second globally after India, with an estimated 1.06 million incident TB cases and approximately 134,000 TB-related deaths annually (Ministry of Health of the Republic of Indonesia, 2024). These figures demonstrate that interrupting TB transmission remains a major public health priority and constitute the basis for

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Indonesia's commitment to eliminate TB by 2030 under Presidential Regulation No. 67 of 2021 (MoH, 2024).

A key strategy for achieving TB elimination is preventing disease progression among individuals at high risk of developing active TB, particularly household contacts of infectious pulmonary TB patients. Household contacts experience prolonged and repeated exposure to *Mycobacterium tuberculosis*, placing them at substantially greater risk of infection and subsequent disease than the general population (Getahun et al., 2015). Tuberculosis Preventive Treatment (TPT) is recognized as one of the most effective interventions for preventing progression from latent tuberculosis infection (LTBI) to active disease, reducing the risk of TB by approximately 60–90% depending on the treatment regimen, treatment adherence, and patient population (Sterling et al., 2020; Zenner et al., 2017). Recent evidence indicates that scaling up TPT together with household contact investigation is a cost-effective intervention that substantially reduces future TB incidence and mortality in high-burden settings (Jo et al., 2021).

Despite its proven effectiveness, TPT implementation remains suboptimal in many low- and middle-income countries. Global evidence suggests that poor TPT uptake and completion are influenced not only by health-system constraints but also by behavioral, psychological, and social determinants, including limited knowledge regarding latent TB infection, misconceptions about preventive treatment, stigma, perceived medication side effects, and inadequate family or community support (Fuady et al., 2018; WHO, 2024). According to the Health Belief Model, preventive health behavior is influenced by perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. Consequently, individuals who do not perceive themselves to be at risk because they are asymptomatic may be less likely to initiate or complete TPT despite its preventive benefits (Rosenstock, 1974). Likewise, Bronfenbrenner's Ecological Systems Theory emphasizes that family members constitute the closest microsystem influencing individual health behavior through emotional, informational, and instrumental support (Bronfenbrenner, 1979). These theoretical perspectives suggest that TPT success is determined by interactions between individual cognition and the surrounding social environment rather than by medical treatment alone.

The challenge is also evident in West Lombok Regency. According to the 2025 West Lombok TB Dashboard, district-level TPT achievement reached only 6.07% of the program target, although contact investigation performance has improved considerably. Among all health centers, Puskesmas Pelangan achieved 25.25%, the second-highest coverage in the district, yet this value remains substantially below the national

target of 100%. This discrepancy indicates that identifying household contacts alone is insufficient to ensure successful preventive treatment completion. Instead, barriers appear to occur during treatment initiation and continuation, particularly in rural and coastal communities where geographic accessibility, socioeconomic limitations, educational attainment, and cultural perceptions regarding TB may influence health-seeking behavior.

Previous studies have consistently demonstrated that knowledge, attitude, and family support are among the most important determinants of adherence to TB preventive therapy. Individuals with better knowledge are more likely to understand the rationale for preventive treatment and adhere to medication (Susanti et al., 2025). Positive attitudes toward TPT have been associated with greater willingness to initiate and complete treatment (Eyre et al., 2020), whereas strong family support facilitates medication adherence through reminders, emotional encouragement, and practical assistance (Fuady et al., 2018; Oshi et al., 2015). Nevertheless, most previous studies have examined these determinants separately or were conducted in urban settings with different sociocultural characteristics.

Research Gap. To our knowledge, no previous study has simultaneously examined the relationships between knowledge, attitude, and family support and TPT success among household contacts in a rural-archipelagic setting such as West Lombok, where geographical barriers, relatively low educational attainment, and strong family-centered social structures may modify preventive treatment behavior. Understanding these determinants is essential for designing context-specific interventions that improve TPT completion beyond merely increasing contact investigation coverage. Therefore, this study aimed to (1) describe the levels of knowledge, attitude, family support, and TPT success among household contacts of drug-susceptible TB patients in the working area of Puskesmas Pelangan, and (2) analyze the associations between knowledge, attitude, family support, and successful completion of Tuberculosis Preventive Treatment.

Method

Study Design and Location

This study employed a quantitative analytical approach with a cross-sectional design, in which the independent variables (knowledge, attitude, and family support) and the dependent variable (TPT success) were measured simultaneously during a single observation period. The study was conducted in the working area of Puskesmas Pelangan, West Lombok Regency, West

Nusa Tenggara, Indonesia. The study site was selected because: (1) TPT achievement remained below the national target despite being relatively higher than that of most other health centers in the district; (2) the contact investigation coverage was high (142.26%), allowing comprehensive identification of household contacts; and (3) the health center represents the characteristics of rural primary healthcare services in West Nusa Tenggara.

Population and Sample

The study population comprised all household contacts of drug-susceptible tuberculosis (DS-TB) patients registered in the Puskesmas Pelangan TB program database during 2024–2025. Participants were selected using purposive sampling based on the following inclusion criteria: (1) household contacts who had undergone contact investigation and were eligible for TPT, (2) aged ≥ 15 years, and (3) willing to participate by providing written informed consent. Exclusion criteria included active TB disease, inability to contact the participant after repeated visits, and medical contraindications to TPT.

The age threshold of ≥ 15 years was chosen because respondents were expected to complete the self-administered questionnaire independently, thereby minimizing proxy-response bias. Consequently, the findings represent determinants of TPT success among adolescent and adult household contacts and cannot be generalized to children under five years of age, who constitute the highest-priority TPT target group according to the Indonesian National TB Control Guidelines (Ministry of Health of the Republic of Indonesia, 2023).

The minimum sample size was calculated using the Lemeshow formula for estimating a single population proportion (Lemeshow et al., 1990):

$$n = Z^2 \times P(1-P) / d^2 \quad (1)$$

Where: n = minimum sample size; Z = standard normal distribution value at the 95% confidence level ($Z = 1.96$); P = estimated proportion of TPT achievement in the population ($P = 0.25$, based on the initial estimated TPT achievement in the study area); d = desired absolute precision ($d = 0.10$). Substituting these values yields:

$$n = (1.96)^2 \times 0.25(1-0.25) / (0.10)^2 = 0.7203 / 0.01 \approx 72.03 \\ \approx 72 \text{ respondents}$$

Based on this calculation, a minimum sample size of 72 respondents was obtained. This study successfully enrolled 80 respondents (exceeding the minimum sample size) out of 84 household contacts meeting the inclusion criteria, with a response rate of 95.2%.

Questionnaire Development, Validity, and Reliability

Data were collected using a structured questionnaire developed from the Indonesian National Tuberculosis Control Guidelines and previous studies on factors influencing tuberculosis preventive treatment adherence. The instrument consisted of three sections: knowledge (15 true/false items), attitude (12 statements measured on a four-point Likert scale), and family support (14 four-point Likert-scale statements). Prior to data collection, the questionnaire underwent content validity assessment by three experts in tuberculosis control and public health to evaluate the relevance, clarity, and comprehensiveness of each item. Revisions were made based on their recommendations to improve wording and content appropriateness.

The revised questionnaire was subsequently pilot-tested among 30 household contacts from another health center with characteristics similar to the study population. Item validity was assessed using Pearson's product-moment correlation, with items considered valid when the corrected item-total correlation exceeded 0.30. Internal consistency reliability was evaluated using Cronbach's alpha coefficient. The final instrument demonstrated acceptable reliability, with Cronbach's alpha values exceeding 0.70 for all questionnaire domains, indicating satisfactory internal consistency.

Data Collection Technique

Data were collected through two methods: (1) structured interviews using standardized questionnaires to measure knowledge (15 true/false questions), attitude (12 statements on a 1–4 Likert scale), and family support (14 statements on a Likert scale); and (2) review of Puskesmas Pelangan TB program records (TB Register 07, the TPT register, and the TPT Treatment Card). The questionnaires had undergone validity testing (Pearson correlation, $r > 0.3$) and reliability testing (Cronbach's alpha > 0.7). TPT success was defined as completion of the full TPT regimen according to national protocol (at least 80% documented medication adherence).

Data Analysis Technique

Descriptive (univariate) analysis was performed to summarize participant characteristics and study variables using frequencies and percentages. Associations between knowledge, attitude, family support, and TPT success were examined using the Chi-square test. Fisher's Exact test was applied when more than 20% of expected cell frequencies were less than five. The strength of associations was expressed as Odds Ratios (ORs) with 95% confidence intervals (95% CIs). Statistical analyses were performed using SPSS version 26, and statistical significance was defined as $p < 0.05$.

Result and Discussion

Overview of the TB Program at Puskesmas Pelangan and West Lombok Regency

Data from the 2025 West Lombok Regency TB Dashboard provide important context before proceeding to the micro-level analysis at Puskesmas Pelangan. At the regency level, achievement of the TB Minimum Service Standard (SPM) reached 107.25%, a figure far exceeding the target because the SPM formula is based on estimated incidence. The case detection rate for drug-sensitive TB (Treatment Coverage/TC SO) at the regency level reached only 62.79%, indicating that nearly 4 out of 10 estimated cases have not yet been detected. The treatment success rate for drug-sensitive TB (Treatment Success Rate/TSR SO) stood at 93.19%, exceeding the WHO target of 90%, indicating relatively good treatment quality.

Figure 1 demonstrates that although most TB program indicators improved steadily between 2020 and 2025, TPT coverage remained consistently low throughout the observation period. Contact investigation increased markedly after 2024, yet this improvement was not accompanied by a proportional increase in TPT completion. Similar implementation gaps have been reported in other high-burden settings. A systematic review by Sagili et al., (2022) showed that, although the proportions of household contacts screened and initiated on TPT were generally high, treatment completion remained substantially lower because of barriers related to health-system capacity, documentation, risk perception, and treatment adherence. Likewise, a mixed-methods implementation study from rural India reported that more than 90% of household contacts were screened, but only 57.8% of eligible contacts completed the diagnostic pathway for TPT because of logistical limitations, stigma, and low perceived risk, demonstrating that major losses occur after contact identification rather than during contact investigation itself (Samudyatha et al., 2023). These findings suggest that strengthening contact

investigation alone is insufficient unless accompanied by interventions that improve treatment initiation, adherence, and follow-up.

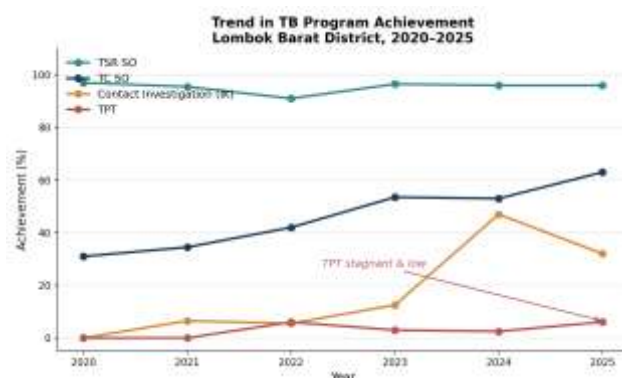


Figure 1. Trend in TB program achievement, West Lombok Regency, 2020–2025 (%) (West Lombok TB Dashboard Trend Data Sheet, 2025. TC SO = Treatment Coverage for Drug-Sensitive TB; TSR SO = Treatment Success Rate; TPT = Tuberculosis Preventive Treatment; IK = Contact Investigation)

Puskesmas Pelangan recorded a relatively strong program profile compared with other health centers, with a TSR SO of 94.69%, TC SO of 76.20%, and contact investigation achievement of 142.26%. Nevertheless, TPT achievement reached only 25.25%, ranking second after Puskesmas Sesela (61.62%) but remaining substantially below the national target. This pattern resembles findings from Indonesia, where a person-centered TPT program in Yogyakarta demonstrated that high TPT uptake (78.8%) and completion (91.5%) were achievable only after combining intensive contact investigation with dedicated adherence monitoring, regular counseling, home-based follow-up, and shorter TPT regimens (Felisia et al., 2023). Compared with the Yogyakarta experience, the lower TPT achievement observed in Pelangan suggests that strengthening adherence support and family-centered follow-up may be more critical than expanding contact investigation coverage alone.

Table 1. Comparison of Selected TB Program Performance Indicators in West Lombok Regency, 2025

Health Center	SPM (%)	TC SO (%)	TSR SO (%)	IK (%)	TPT (%)
Pelangan	176.61	76.20	94.69	142.26	25.25
Sesela	121.14	60.30	100.00	172.04	61.62
Suranadi	214.95	42.18	100.00	197.32	13.77
Narmada	195.48	44.02	96.67	172.45	18.14
Gerung	188.50	77.62	94.51	71.53	4.73
Gunungsari	145.02	45.79	98.28	44.12	12.81
Kediri	117.82	49.10	93.41	126.31	6.29
Lingsar	132.38	52.00	94.74	89.95	0.00
Banyumulek	127.19	70.91	93.33	23.82	0.00
West Lombok Regency	107.25	62.79	93.19	31.74	6.07

Source: West Lombok Regency TB Dashboard, 2025. SPM = Minimum Service Standard; TC SO = Treatment Coverage for DS-TB; TSR SO = Treatment Success Rate for DS-TB; IK = Contact Investigation; TPT = Tuberculosis Preventive Treatment.

Respondent Characteristics

Of the 84 eligible household contacts, 80 agreed to participate, resulting in a response rate of 95.2%. The majority of respondents were female (57.5%), aged 26–45 years (43.8%), had completed only primary or junior secondary education (61.3%), and were employed as farmers, fishers, or homemakers (68.8%). These characteristics reflect the sociodemographic profile of the rural coastal communities of Sekotong Subdistrict, where livelihoods largely depend on the informal sector and access to education and healthcare remains relatively limited. Such socioeconomic conditions have been recognized as structural determinants that may hinder the uptake and completion of tuberculosis preventive treatment (TPT) through reduced health literacy, transportation barriers, and competing economic priorities (WHO, 2024; Wingfield et al., 2016).

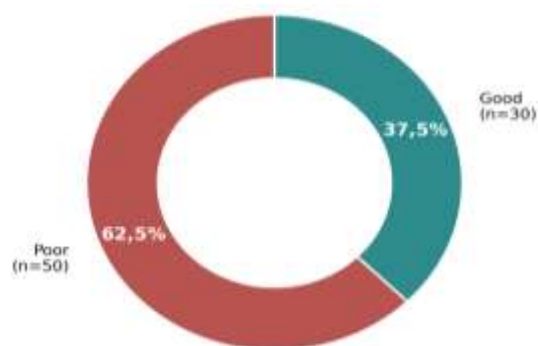


Figure 2. Distribution of respondents' knowledge level

The predominance of respondents with relatively low educational attainment is particularly relevant because education is closely associated with health literacy and the ability to understand preventive health information. Individuals with limited education may experience greater difficulty understanding the concept of latent tuberculosis infection (LTBI), the rationale for preventive treatment, and the importance of completing medication despite the absence of symptoms. Previous studies have demonstrated that lower educational attainment is associated with poorer knowledge of TB, lower treatment adherence, and reduced utilization of preventive health services (Alsdurf et al., 2016; Sagili et al., 2022).

Furthermore, the occupational profile of respondents suggests additional challenges to treatment adherence. Farmers and fishers often have irregular working hours and seasonal income, making routine visits to health facilities and consistent medication-taking more difficult. Similar findings have been reported in other rural TB-endemic settings, where indirect costs, transportation difficulties, and opportunity costs associated with seeking care

contribute substantially to treatment interruption (Fuady et al., 2018; Wingfield et al., 2016).

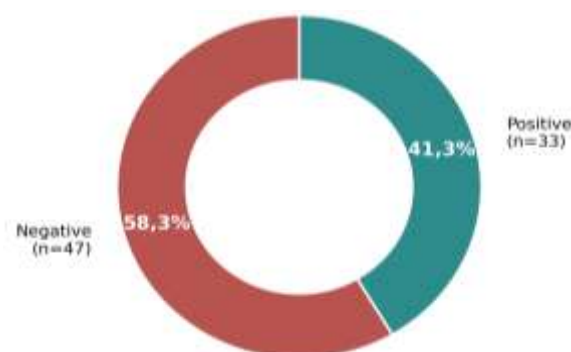


Figure 3. Distribution of respondents' attitude toward TPT

As described in the Methodology section, only respondents aged 15 years or older were included because the study variables (knowledge, attitude, and family support) were measured using self-administered questionnaires. Consequently, the findings represent determinants of TPT success among adolescent and adult household contacts and cannot be generalized to children under five years of age, who remain the highest-priority target group for TPT according to the Indonesian National Tuberculosis Control Guidelines (Ministry of Health of the Republic of Indonesia, 2023). Future studies should therefore involve primary caregivers as proxy respondents to better understand behavioral and social determinants influencing TPT completion among young children.

Respondents' Knowledge

Based on the knowledge questionnaire score category (cut-off 75%), 50 respondents (62.5%) were categorized as having poor knowledge, while 30 respondents (37.5%) had good knowledge. The items with the lowest proportion of correct answers concerned the duration of TPT (36.3% correct) and the importance of examining asymptomatic contacts (42.5% correct). These findings indicate that understanding of latent tuberculosis infection (LTBI), which forms the basis of tuberculosis preventive treatment (TPT), remains inadequate among household contacts.

This finding is consistent with Samudyatha et al. (2023), who reported that inadequate knowledge regarding latent TB infection, the purpose of preventive treatment, and the absence of symptoms substantially reduced acceptance and completion of TPT among household contacts in rural India. Similarly, Zhang et al. (2023) found that misconceptions about TB transmission and limited awareness of preventive therapy were associated with lower participation in household contact management, emphasizing that educational interventions remain essential for improving TPT

implementation in high-burden settings. Furthermore, Abu-humaidan et al. (2022) demonstrated that household contacts with higher TB-related knowledge were significantly more likely to adopt preventive health behaviors, whereas limited health literacy in rural populations contributed to poor engagement in TB prevention programs. In the context of Pelangan, relatively low educational attainment, limited access to health information, and the geographical characteristics of coastal communities may further contribute to inadequate understanding of LTBI and TPT. Although contact investigation coverage reached 142.26%, indicating that health workers successfully identified eligible household contacts, the educational component delivered during these visits appears insufficient to establish a comprehensive understanding of latent TB infection and the importance of completing preventive treatment.

Respondents' Attitude

A total of 47 respondents (58.3%) showed a negative attitude toward TPT, while 33 respondents (41.3%) had a positive attitude. The statements with the most negative responses were "I do not need to take medication because I do not feel sick" (agreed to by 68.8% of respondents) and "Taking TB medication lets other people know I might have TB" (agreed to by 55%). These two statements reveal two major attitudinal barriers: perceived invulnerability (not feeling at risk because of being asymptomatic) and social stigma that discourages acknowledgment of one's status as a TB contact.

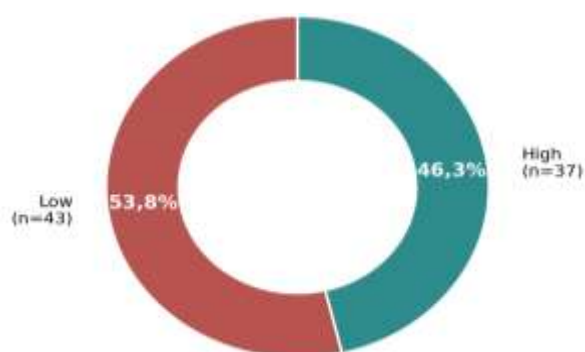


Figure 4. Distribution of family support

This finding resonates with a study by Fuady et al. (2018), which emphasized that TB stigma in Indonesia affects not only patients but also family members, who avoid preventive treatment for fear of being shunned by the community. From the perspective of the Health Belief Model, a negative attitude dominated by low perceived susceptibility and high perceived barriers (stigma) will theoretically hinder preventive behavior even when knowledge is already present.

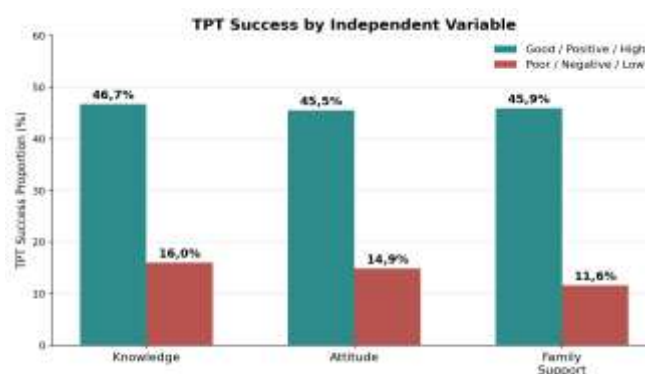


Figure 5. TPT Success by independent variable

Family Support

Low family support was reported by 43 respondents (53.8%), whereas 37 respondents (46.3%) received high family support. Among the four dimensions of family support, instrumental support—particularly the availability of family members to remind respondents to take their medication and accompany them to the health center—received the lowest scores. This finding is likely related to the socioeconomic characteristics of the study population. Most household heads worked as fishers or daily laborers with irregular working hours, limiting their ability to provide consistent supervision and practical assistance during the TPT period. In rural coastal communities such as Pelangan, economic demands often take precedence over caregiving responsibilities, potentially reducing adherence support within the household.

The informational support dimension was also relatively weak, indicating that limited knowledge about TB and TPT extended beyond the respondents themselves to other family members. As family members are often the primary source of encouragement and treatment reminders, inadequate understanding within the household may reduce the effectiveness of preventive treatment. This finding is consistent with evidence showing that active family engagement and comprehensive household education are critical for improving participation in tuberculosis prevention programs, increasing adherence to preventive interventions, and strengthening treatment support among household contacts (Putra et al., 2023; Rakhmawati et al., 2019). Similarly, a systematic review by van Hoorn et al. (2016) demonstrated that psychosocial and family support significantly improve treatment adherence and treatment outcomes among individuals receiving TB-related therapy. These findings suggest that TPT interventions should extend beyond individual counseling by actively involving family members through household-based education, adherence counseling, and community health worker

support to strengthen the family's role as the primary support system.

Analysis of the Relationship between Variables and TPT Success

Of the 80 respondents, 22 (27.5%) successfully completed TPT in full, while 58 (72.5%) did not. This

success rate is higher than the aggregate health-center achievement (25.25%) because this analysis only accounts for respondents who had started TPT, not the entire population of eligible contacts.

All three independent variables showed a statistically significant relationship with TPT success. Each is discussed below.

Table 2. Results of the Bivariate Analysis of the Relationship between Independent Variables and TPT Success

Variable	Successful N (%)	Unsuccessful N (%)	Total N (%)	p-value	OR (95% CI)
Knowledge – Good	14 (46.7%)	16 (53.3%)	30 (100%)	0.012*	3.50 (1.27–9.67)
Knowledge – Poor	8 (16.0%)	42 (84.0%)	50 (100%)		
Attitude – Positive	15 (45.5%)	18 (54.5%)	33 (100%)	0.008*	4.17 (1.44–12.04)
Attitude – Negative	7 (14.9%)	40 (85.1%)	47 (100%)		
Family Support – High	17 (45.9%)	20 (54.1%)	37 (100%)	0.003*	5.95 (1.94–18.22)
Family Support – Low	5 (11.6%)	38 (88.4%)	43 (100%)		

*Statistically significant ($p < 0.05$). Chi-square test. OR = Odds Ratio; CI = Confidence Interval.

Relationship between Knowledge and TPT Success

Respondents with good knowledge were 3.5 times more likely to complete TPT than those with poor knowledge (OR = 3.50; 95% CI: 1.27–9.67; $p = 0.012$). This finding indicates that understanding the purpose and benefits of preventive therapy reduces uncertainty regarding medication use among asymptomatic household contacts. Many respondents incorrectly believed that preventive treatment was unnecessary in the absence of symptoms, suggesting inadequate understanding of latent TB infection (LTBI). Similar misconceptions have been reported in high-burden settings, where household contacts frequently equate the absence of symptoms with the absence of disease risk, thereby reducing willingness to initiate or complete TPT (Alsdurf et al., 2016; Fox et al., 2015).

From the perspective of the Health Belief Model (HBM), inadequate knowledge lowers perceived susceptibility and perceived benefits while increasing perceived barriers to treatment adherence. Individuals who do not understand that latent TB infection may progress to active disease are less likely to perceive preventive treatment as necessary. Consequently, although TPT recipients are clinically healthy, they may consider long-term medication unnecessary or fear potential adverse effects more than the future risk of TB disease (Carpenter, 2010; Rosenstock, 1974). Previous studies have similarly shown that greater knowledge regarding TB transmission, latent infection, and the effectiveness of preventive therapy is consistently associated with higher treatment initiation and completion rates (Alsdurf et al., 2016; Sagili et al., 2022).

In the rural communities of West Lombok, limited educational attainment, restricted access to health information, and geographical barriers may further weaken the translation of knowledge into preventive behavior. Although Puskesmas Pelangan achieved a

high contact investigation rate, educational messages delivered during household visits may not have been sufficiently comprehensive to improve understanding of latent TB infection and the rationale for preventive therapy. Moreover, many residents work as farmers or fishers with irregular working hours, limiting opportunities to receive repeated health education or counseling. These structural barriers indicate that knowledge alone may be insufficient to ensure successful treatment completion unless accompanied by continuous communication and follow-up support.

This finding is consistent with previous evidence indicating that adequate knowledge regarding latent tuberculosis infection and preventive therapy facilitates TPT uptake and completion by improving treatment acceptance and reducing misconceptions about asymptomatic infection (Samudiyatha et al., 2023; Zhang et al., 2023). Similarly, a systematic review by Alsdurf et al., (2016) identified inadequate patient knowledge as one of the principal barriers to TPT adherence across high-burden countries, while Sagili et al., (2022) emphasized that educational interventions substantially improve treatment initiation and completion among household contacts. However, the OR observed in the present study was lower than those reported in previous studies. This difference is likely attributable to the local context of Pelangan, where structural factors—including long travel distances to health facilities, transportation costs, irregular occupational patterns, and limited availability of health information—moderate the relationship between knowledge and preventive behavior. A study by Karbito et al. (2022) in rural Central Java similarly found that the influence of knowledge on treatment adherence was weaker in rural than in urban communities, suggesting that contextual barriers reduce the effect of individual-level determinants.

These findings imply that TB education programs should extend beyond simply explaining the duration of TPT. Educational interventions should emphasize the concept of latent TB infection, the future risk of progression to active disease, and the long-term benefits of preventive therapy. Integrating repeated counseling into contact investigation visits and involving family members in educational sessions may strengthen knowledge retention and improve TPT completion among household contacts.

Relationship between Attitude and TPT Success

The relationship between attitude and TPT success showed a higher odds ratio than knowledge (OR = 4.17; 95% CI: 1.44–12.04; $p = 0.008$), indicating that attitude is a stronger determinant of successful TPT completion than knowledge alone. Although knowledge provides the cognitive foundation for understanding disease prevention, attitude reflects an individual's willingness to translate that knowledge into preventive behavior. This finding is consistent with the Health Belief Model, which emphasizes that preventive behavior is influenced by perceived susceptibility, perceived benefits, and perceived barriers rather than knowledge alone (Carpenter, 2010; Rosenstock, 1974).

In the present study, many respondents believed that preventive medication was unnecessary because they did not feel ill and expressed concerns about being stigmatized if others knew they were taking TB medication. These findings indicate that low perceived susceptibility and fear of social stigma remain important barriers to TPT completion. Similar barriers have been reported in a systematic review by Sagili et al. (2022), which identified misconceptions about latent TB infection, fear of adverse drug effects, and TB-related stigma as common reasons for poor TPT uptake and completion among household contacts. Likewise, the WHO Global Tuberculosis Report 2024 recognizes stigma and inadequate risk perception as persistent obstacles to achieving high TPT coverage and completion.

Compared with previous studies, the association observed in this study (OR = 4.17) confirms that attitude is a key determinant of TPT completion, although its magnitude may vary across settings depending on local sociocultural and health-system contexts (Sagili et al., 2022; WHO, 2024). In rural West Lombok, close community relationships may intensify concerns about social judgment, making household contacts reluctant to continue preventive treatment despite having adequate knowledge. Therefore, TPT interventions should combine health education with stigma-reduction strategies and motivational counseling to strengthen positive attitudes and improve treatment completion.

Relationship between Family Support and TPT Success

Family support was the factor most strongly associated with successful tuberculosis preventive treatment (TPT) completion in this study (OR = 5.95; 95% CI: 1.94–18.22; $p = 0.003$). Household contacts receiving high family support were almost six times more likely to complete TPT than those with lower levels of support. This effect exceeded the associations observed for both knowledge and attitude, highlighting family support as the most influential social determinant of treatment completion.

This finding is consistent with previous studies demonstrating the importance of family and social support in tuberculosis care. Oshi et al. (2016) reported that family support was one of the strongest predictors of successful TB treatment completion (AOR = 4.67), while Fuady et al. (2018) identified social support as a protective factor against treatment interruption among Indonesian patients with tuberculosis. Similar findings have been reported in studies demonstrating that active family involvement and household support improve adherence to tuberculosis preventive treatment through medication reminders, emotional support, and assistance in accessing healthcare services (Rakhmawati et al., 2019; Zhang et al., 2023).

Bronfenbrenner's Ecological Systems Theory (1979) provides a useful framework for interpreting these findings by positioning the family as the closest microsystem influencing everyday health behavior. Unlike curative treatment, TPT requires sustained adherence over several months despite the absence of symptoms, making continuous support from family members particularly important. In this context, medication reminders, accompaniment to health services, emotional encouragement, and practical assistance become essential components of treatment continuity. In coastal rural communities such as Pelangan, health-related decisions are frequently made collectively within the household, reinforcing the central role of family support in maintaining adherence. Conversely, the irregular working schedules of fishermen may limit opportunities for direct supervision, which may explain why instrumental support represented the weakest dimension in this study.

The findings suggest that family support may help sustain treatment adherence by reinforcing motivation and reducing practical barriers to treatment completion. Therefore, interventions focusing exclusively on individual TPT recipients may be insufficient. Integrating family-centered education, counseling, and treatment-support strategies into routine contact investigation and TPT services may strengthen treatment completion more effectively than individual-focused educational approaches alone.

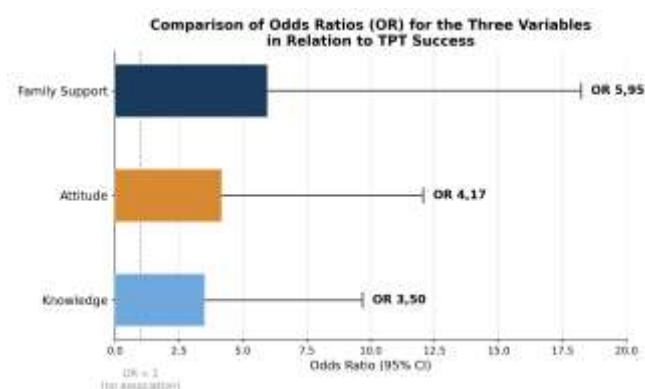


Figure 6. Comparison of Odds Ratios (OR) for the three variables in relation to TPT success

The higher the OR, the stronger the association of the variable with TPT success. All ORs are statistically significant ($p < 0.05$).

Policy Implications of the Findings

Key Insight: There is a “Pelangan paradox” the high IK achievement (142.26%) is not matched by a corresponding level of TPT success. This shows that the bottleneck lies not in access to contacts but in the conversion from investigation to TPT completion. The main barriers are low knowledge, negative attitudes (largely due to stigma), and weak family support three factors that interact with one another.

This finding has several practical implications. First, TB education programs need to be designed not only for TPT recipients but also for all members of the household, given that low family-level knowledge is correlated with weak family support. Second, stigma-focused counseling approaches need to be integrated into contact investigation visits rather than added as a separate activity. Third, a family-based medication supervision model (Family-Based Preventive DOT) should be considered as a local adaptation of the PMO (Medication Supervisor) strategy, which has so far focused on active TB.

Compared with Puskesmas Sesela, which has the highest TPT achievement in the regency (61.62%), the data show that Sesela's IK is also higher (172.04%), with a TSR SO of 100%. This suggests a synergistic effect between a strong treatment system, large-scale contact investigation, and not yet documented in secondary data a possibly more intensive community education program. A comparative study between Pelangan and Sesela could be a valuable direction for future research.

Study Limitations

This study has several limitations. First, the cross-sectional design does not allow for causal conclusions; the relationships identified are associative in nature. Second, as explained in the Methodology section, the

inclusion criterion of age ≥ 15 years set so that respondents could complete the self-report questionnaire independently meant that toddler contacts (< 5 years), the highest-priority group for TPT recipients, were not represented as a unit of analysis in this study. The determinants of knowledge, attitude, and family support experienced by caregivers of toddler contacts may differ in character and warrant separate investigation. Third, data were collected from a single health center, so generalization to other regions with different sociodemographic characteristics should be made with caution.

Conclusion

This study produced several key findings. First, the profile of the TB program at Puskesmas Pelangan shows a paradoxical pattern: good treatment performance and contact investigation, yet TPT achievement (25.25%) that remains very far from the target. Second, most household contacts of DS-TB patients in this area had poor knowledge (62.5%), a negative attitude (58.3%), and low family support (53.8%) three conditions that together create an environment unconducive to TPT success. Third, bivariate analysis confirmed significant relationships between knowledge (OR 3.50; $p = 0.012$), attitude (OR 4.17; $p = 0.008$), and family support (OR 5.95; $p = 0.003$) with TPT success. Family support was the variable with the strongest association, underscoring the importance of family-based approaches in TPT programs. The main recommendations arising from this study are: (1) developing a TB education package that targets all members of a contact's household, not only TPT recipients; (2) integrating anti-stigma counseling into the contact investigation protocol; (3) establishing community-based peer support mechanisms to sustain TPT recipients' motivation throughout the treatment period; and (4) conducting further research using a prospective cohort design that also involves toddler contacts and their caregivers, in order to confirm causal relationships and identify factors that mediate or moderate these associations.

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Conflicts of Interest

The authors declare no conflict of interest.

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