

A DETERMINANT MODEL OF TUBERCULOSIS TREATMENT COMPLIANCE MANAGEMENT BASED ON BEHAVIOR, FAMILY SUPPORT, AND HEALTH WORKERS: BATAM CASE STUDY

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Abstract

Adherence to Anti-Tuberculosis Drugs (ATD) is a primary determinant of successful TB therapy and prevention of drug resistance. Non-adherence significantly contributes to treatment failure, relapse, and increased public health burden, especially in high-mobility urban areas such as Batam City. The novelty of this study lies in the simultaneous integration of patient behavior, family support, and healthcare worker roles into a single determinant model of TB treatment adherence management in an archipelago urban context. This study aimed to analyze factors affecting ATD adherence among pulmonary TB patients at Baloi Permai Primary Health Center, Batam. A quantitative cross-sectional study with a statistical model output was conducted on 142 pulmonary TB patients undergoing treatment from July 2025 to April 2026 using total sampling. Data were collected through validated structured questionnaires and analyzed using chi-square tests and Backward Stepwise logistic regression. Bivariate analysis revealed that attitude ($p=0.043$) and family support ($p=0.001$) significantly influenced ATD adherence. Multivariate analysis identified family support as the dominant determinant with an Odds Ratio of 6.313 (95% CI=1.557–25.606; $p=0.010$), indicating that patients receiving good family support were 6.313 times more likely to adhere to treatment than those without adequate support. It is concluded that family support is the primary determinant of ATD adherence. Strengthening family involvement in TB management programs at primary health centers, through education, motivation, and optimization of family Drug Supervision roles, should be prioritized as an intervention strategy.

Keywords: Family Support; Adhesion; Health Management; Behavior; Tuberculosis

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INTRODUCTION

Tuberculosis (TB) is still a global and national public health problem that has a major impact on health, social, and economic aspects. Although TB is a preventable and treatable disease, in 2023 TB ranks second highest among causes of death from the world's single infectious agent after COVID-19. Globally, there are an

estimated 10.8 million TB cases, with 1.1 million deaths, including HIV-TB, as well as 161,000 deaths in HIV-positive people. This condition confirms that TB control is still a major challenge, so the reduction of TB incidence and mortality is set as the main target in the (1,2) (3) (4,5) *Sustainable Development Goals (SDGs)* and *the End TB Strategy* to reduce 90%

of deaths and 80% of incidents by 2030 compared to 2015. (6,7)

Indonesia ranks second in the world after India as the country with the highest burden of TB. Every year, it is estimated that there are around 969 thousand cases of TB, with a death rate of 93 thousand people, or equivalent to 11 deaths per hour. The burden of TB mostly occurs in the productive age group of 25-34 years, having a direct impact on labor productivity, so that TB is not only a health problem, but also a national development problem. A systematic study by Mahartati et al. (2024) shows that non-compliance with OAT is a major factor in the cause of treatment failure and the emergence of MDR TB in various developing countries, including in the Southeast Asian region. (8,9) (10) (5,11) (12)

At the local level, Batam City, as an archipelagic urban area with high population density and mobility, faces complex challenges in TB control. The burden of TB in Batam City, especially in the working area of the Baloi Permai Health Center, is still relatively high, as reported by Herdianti et al. (2025). The success of TB treatment is largely determined by the patient's adherence to taking OAT regularly and completely for 6–9 months without interruption. Treatment non-adherence has the potential to lead to therapy failure, recurrence, as well as the emergence of drug-resistant TB (MDR-TB), which increases the burden of financing and the

risk of transmission in the community. (13) (11) (14) (15,16)

OAT adherence is a multifactorial phenomenon that is influenced by patient behavior, social support, and the healthcare system. The Health Belief Model (HBM) theory by Rosenstock et al. explains that treatment adherence is influenced by an individual's perceptions of susceptibility, disease severity, benefits and barriers to action, as well as cues to act that come from the immediate social environment, including the family. Patient behavior that includes knowledge, attitudes, and actions determines the consistency of taking medication. Family support has been shown to play an important role in supervision and motivation during the treatment period. Health workers play a strategic role in education, mentoring, and compliance monitoring. However, studies that integrate these three factors simultaneously in a single determinant model, especially in the context of archipelago urban areas, are still very limited. (17) (18,19) (20,21) (22)

The study by Widiastutik et al. (2020) examined the relationship among family support, cadres, and health workers without comprehensively including aspects of patient behavior. Hasina et al. (2023) focused on knowledge without analyzing family support. Mariska et al. (2025) analyzed the roles of officers and PMOs but did not fully integrate behavioral variables. The novelty of this

research lies in (23) (24) (22) three aspects that distinguish it from previous studies. First, in terms of variable integration: this study developed a determinant model that integrates aspects of patient behavior (knowledge, attitudes, actions), family support, and the role of health workers simultaneously in one multivariate analysis, which has never been done simultaneously in the TB population in Batam City. Second, in terms of product analysis: this study produces a multivariate logistic regression statistical model based on local data from the Baloi Permai Health Center that can be used as a reference for TB program planning specifically in the region, not just a bivariate relationship test. Third, in terms of regional context: the research was carried out in Batam City as an archipelagic urban area with high characteristics of cross-border population mobility, settlement density, and diversity of socio-economic backgrounds of migrant workers in a context that is epidemiologically different from the mainland. This study aims to : (1) analyze the influence of patient knowledge, attitudes, and actions on OAT adherence; (2) analyze the influence of family support on OAT adherence; (3) analyze the influence of the role of health workers on OAT adherence; and (4) developing a model of TB treatment compliance determinants based on multivariate logistic regression in pulmonary TB patients at the Baloi Permai Health Center, Batam City as a reference for TB program management in urban areas of the archipelago.

METHODS

This study uses a quantitative approach with an analytical observational design in a *cross-sectional study* design. The analysis was carried out in stages ranging from univariate, bivariate (chi-square test), to multivariate (*Backward Stepwise logistic regression*) analysis to produce a model of the determinants of OAT adherence. The research was carried out at the Baloi Permai Health Center, Batam City, Riau Islands, in the period of July 2025 to April 2026. The Baloi Permai Health Center was chosen as the research location because it is one of the primary health facilities with a relatively high burden of pulmonary TB cases in Batam City. (11)

The study population consisted of all pulmonary TB patients who were undergoing OAT treatment and were recorded in the TB information system (SITB) at the Baloi Permai Health Center in the period of July 2025 to April 2026, which is 142 people. The sampling technique used was total sampling, so all members of the population were made research respondents (n=142). Inclusion criteria include patients with pulmonary TB who are clinically and bacteriologically diagnosed, are ≥ 15 years old, are in the OAT treatment phase, and are willing to participate. Exclusion criteria include TB-MDR patients and patients in uncooperative conditions at the time of data collection.

Independent variables in this study included: (1) patients' knowledge of TB and its treatment; (2) the patient's attitude towards TB treatment; (3) the patient's actions or practices in supporting medication compliance; (4) family

support that includes aspects of supervision, motivation, and active involvement during treatment; and (5) the role of health workers in education, mentoring, and monitoring patient compliance. The dependent variable was adherence to anti-tuberculosis treatment (OAT), categorized as adherent or non-adherent based on whether patients took their medication according to the prescribed treatment schedule.

Data were collected using a structured questionnaire compiled based on a literature review and national TB program indicators. The questionnaire consists of five sections that measure each independent variable, and one section measures medication adherence. Before being used in the study, the questionnaire was tested for validity and reliability on 30 respondents outside the study sample. Instrument validity was assessed using Pearson's correlation coefficient by comparing the calculated correlation coefficient (r) with the critical value from the Pearson correlation table ($r_{table}=0.361$; $n=30$, $\alpha=0.05$). All statement items in each variable are declared valid with a *calculated r-value* ranging from 0.412–0.847. Reliability tests were conducted using Cronbach's Alpha with the following results: knowledge variables ($\alpha=0.783$), attitude ($\alpha=0.812$), actions ($\alpha=0.796$), family support ($\alpha=0.841$), role of health care workers ($\alpha=0.827$), and adherence to taking OAT ($\alpha=0.804$). All variables met the predetermined

reliability standard ($\alpha \geq 0.70$) [25], so the instrument was reliable for use. Data collection was carried out through guided interviews and self-administered questionnaires.

Data analysis was carried out in stages using SPSS software version 26. Univariate analysis was performed to describe the frequency distribution and percentage of each variable. Bivariate analysis was performed using the chi-square test ($\alpha=0.05$) to examine the association between each independent variable and OAT adherence. Multivariable logistic regression analysis was performed using the backward stepwise selection method. Variables with a p -value < 0.25 in the bivariate analysis were included as candidate variables for the multivariable model. The results were presented as regression coefficients (B), Wald chi-square statistics, p -values, odds ratios (ORs), and 95% confidence intervals (95% CIs). This research has received ethical approval from the research ethics committee with Number: 0208/UIS.19/KEP/VI/2025 on June 17, 2025.

RESULTS AND DISCUSSION

Results

This study included 142 patients with pulmonary tuberculosis who were receiving anti-tuberculosis treatment at the Baloi Permai Health Center, Batam City. The demographic and clinical characteristics of the respondents are presented in Table 1.

Table 1. Characteristics of Pulmonary TB Patients at Baloi Permai Health Center, Batam City in 2026 (n=142)

Characteristics	n	%
Gender		
Male	84	59,2
Women	58	40,8
Age		
15–60 years old	135	95,1
>60 years old	7	4,9
Education		
SD	8	5,6
Junior High School	11	7,7
High School	81	57,0
College	42	29,6
Marital Status		
Unmarried	62	43,7
Marriage	71	50,0
Widow	5	3,5
Doubt	4	2,8
Jobs		
Not Working	28	19,7
Labourer/Builder	6	4,2
Self-Employed/Private Employee	67	47,2
PNS	4	2,8
Others	37	26,1
Length of TB Treatment		
0–2 months	51	35,9
2–6 months	91	64,1
Living with Family		
Yes	93	65,5
No	49	34,5
Medication Supervisor (PMO)		
None	32	22,5
Family (spouse, parents, children, siblings)	94	66,2
Health Workers (nurses, midwives)	16	11,3
Total	142	100,0

Source: Primary Data, 2026

As shown in Table 1, the majority of the 142 respondents were male (84, 59.2%). The

dominance of men in TB cases is in line with the WHO report (2023), which shows that men have

a two to three times higher risk of TB than women, due to exposure to the work environment and smoking behavior. The largest age group was 15–60 years old (95.1%), suggesting that pulmonary tuberculosis predominantly affected the working-age population in the study setting. This is consistent with national data, which states that the greatest burden of TB occurs in the productive age group of 25–34 years. The highest level of education was high school graduates

(57.0%), indicating that most respondents had sufficient health literacy to understand the importance of TB treatment. Most of the respondents (50.0%) were married and lived with their families (65.5%), with the most PMO coming from family members (66.2%). (1) (25,26)

The distribution of research variables is presented in Table 2 below.

Table 2. Univariate Analysis of Research Variables for Pulmonary TB Patients at Baloi Permai Health Center, Batam City in 2026 (n=142)

Variable	n	%
Knowledge		
Less	32	22,5
Enough	44	31,0
Good	66	46,5
Attitude		
Less	31	21,8
Enough	48	33,8
Good	63	44,4
Actions		
Less	15	10,6
Enough	24	16,9
Good	103	72,5
Family Support		
Less	11	7,7
Enough	18	12,7
Good	113	79,6
The Role of Health Workers		
Less	3	2,1
Enough	14	9,9
Good	125	88,0
OAT Drinking Adherence		
Non-compliant	22	15,5
Obedient	120	84,5
Total	142	100,0

Source: Primary Data, 2026

Based on Table 2, the majority of respondents had good knowledge (46.5%), good attitudes (44.4%), good actions (72.5%), good family support (79.6%), and good role of health workers (88.0%). The high proportion of good health workers reflects the optimal performance of the Baloi Permai Health Center health workers in educating and assisting TB patients. The compliance rate with OAT in this study reached 84.5%, while 15.5% of respondents were still

classified as non-compliant. This rate of non-compliance is a serious concern considering that TB treatment requires regularity of OAT consumption for at least 6 months without interruption to prevent therapy failure and drug resistance. (27,28)

The relationship between each independent variable and OAT drinking adherence was analyzed using the chi-square test and presented in Table 3.

Table 3. Bivariate Analysis of Factors Affecting OAT Drinking Compliance at Baloi Permai Health Center, Batam City in 2026 (n=142)

Variable	Non-compliant		Obedient		Total		p-value
	n	%	n	%	N	%	
Knowledge							
Less	5	3,5	27	19,0	32	22,5	0,312
Enough	9	6,3	35	24,6	44	31,0	
Good	8	5,6	58	40,8	66	46,5	
Attitude							
Less	0	0,0	31	21,8	31	21,8	0,043
Enough	13	9,2	35	24,6	48	33,8	
Good	9	6,3	54	38,0	63	44,4	
Actions							
Less	0	0,0	15	10,6	15	10,6	0,214
Enough	0	0,0	24	16,9	24	16,9	
Good	22	15,5	81	57,0	103	72,5	
Family Support							
Less	6	4,2	5	3,5	11	7,7	0,001
Enough	7	4,9	11	7,7	18	12,7	
Good	9	6,3	104	73,2	113	79,6	
The Role of Health Workers							
Less	0	0,0	3	2,1	3	2,1	0,587
Enough	0	0,0	14	9,9	14	9,9	
Good	22	15,5	103	72,5	125	88,0	

Source: Primary Data, 2026

Based on Table 3, the chi-square test results showed that the variables of attitude ($p=0.043$) and family support ($p=0.001$) had a significant effect on OAT drinking adherence ($p<0.05$). In contrast, the variables of knowledge ($p=0.312$), actions ($p=0.214$), and the role of health workers ($p=0.587$) did not show a significant bivariate influence. Family support had the smallest p-value (0.001), indicating the strongest strength of the relationship. Family support had the smallest p-value (0.001), indicating the strongest statistical evidence of an association with adherence to anti-tuberculosis treatment. Of the 11 respondents with poor family support, 6 (54.5%) did not comply, while of the 113 respondents with good family support, only 9 people (8.0%) did not comply.

Multivariate analysis using logistic regression using *the Backward Stepwise* method was performed on the candidate's eligible variables ($p<0.25$ in bivariate). All five variables were included in Step 1 with a Nagelkerke R^2 value of 0.768. Through backward stepwise elimination, the final model (Step 5) retained only one statistically significant variable, resulting in the most parsimonious model. The results of *the Omnibus Test of Model Coefficients* showed that the overall model was significant ($\chi^2=17.511$; $df=4$; $p=0.002$), indicating that the model provided a significantly better fit to the data than the intercept-only model. The final results of the logistic regression are presented in Table 4.

Table 4. Logistic Regression Results of the Dominant Factor of OAT Drinking Compliance (Final Model – Step 5)

Variable	B	OR	Wald	df	Sig.	Exp(B)	95% CI Lower	95% CI Upper
Family Support	1,842	0,714	6,657	1	0,010	6,313	1,557	25,606
Constant	-2,891	1,783	2,629	1	0,105	0,056		

Source: Primary Data, 2026

Based on Table 4, family support was the only variable that consistently had a significant effect on OAT adherence in the final model ($B=1,842$; $Wald=6,657$; $p=0.010$; $OR=6,313$; $95\% CI=1,557-25,606$). The final model had a Nagelkerke R^2 value of 0.618, indicating that approximately 61.8% of the variation in adherence to anti-tuberculosis treatment (OAT) was explained by the model. The logistic regression equation formed is:

$$\text{Ln(OAT Drinking Adherence)} = -2,891 + 1,842 (\text{Family Support})$$

An OR of 6.313 means that TB patients who received good family support had a 6.313 times greater chance of complying with OAT than patients with insufficient or sufficient family support, after controlling for other variables.

Discussion

The Effect of Family Support on OAT

Drinking Adherence

The findings of this study indicate that family support is the dominant determinant of OAT adherence (OR=6.313; $p=0.010$), which means that patients with good family support are six times more likely to be compliant than those without adequate support. These results are consistent with the Social Support Theory proposed by Berkman & Glass, which suggests that social networks—especially the nuclear family—influence health behaviors through psychological pathways (stress reduction and increased self-efficacy) as well as behavioral pathways (supervision and facilitation of access to health services). In the context of TB, the family serves as a primary support system that affects the consistency of taking medication daily for months. (29) (30)

Jang & Lee (2022), in a study in Korea, found a significant positive correlation between family support and TB treatment adherence, with the family acting as a source of emotional, instrumental, and informational support. Widiastutik et al. (2020) reported a similar thing in the Indonesian context, where TB patients with good family support had much higher adherence to treatment. Arsyad (2024) also found a meaningful relationship between family support and OAT adherence in Indonesia. At the international level, Alinaitwe et al. (2025) identified family support as a major protective factor influencing TB treatment adherence

through medication reminders and daily emotional motivation. (4) (23) (30) (21)

Family support in the context of TB treatment includes four complementary dimensions: (1) emotional support – empathy, care, acceptance, and psychological assistance during OAT side effects; (2) instrumental support – provision of transportation, costs, nutritious food, and medication reminders; (3) informational support – providing information about the importance of treatment completeness and the risk of drug resistance; and (4) assessment support – positive feedback on treatment progress and motivation strengthening (4,19).

These findings prove that in the context of long-term TB treatment in urban areas of the archipelago, social factors, especially family support, have predictive power that goes far beyond individual cognitive factors. This can be understood through Social Support Theory (Berkman & Glass), which describes two pathways of family influence on health behaviors: psychological pathways through stress reduction and increased self-efficacy, and behavioral pathways through direct supervision and facilitation of access to services [30]. In the context of Batam as an industrial city with long working hours and high mobility, the function of family supervision is crucial because patients are prone to missing medication schedules amid work pressure. The high proportion of PMO from families in this study strengthens the argument that the family is not just a passive supporting factor, but an active agent that determines the

consistency of daily treatment. The consistency of these findings with Jang & Lee (2022) in Korea [4], Widiastutik et al. (2020) in Indonesia [23], and Alinaitwe et al. (2025) in Uganda [21] indicates that the central role of families in TB treatment adherence is universal and cross-cultural.

The managerial implications of these findings are strategic. The Baloi Permai Health Center needs to develop a structured TB family strengthening program, including: (1) family education sessions at least once per month in the format of TB patients' family classes; (2) family PMO training using standardized modules based on TB FaST [30]; (3) periodic home visits by community nurses; (4) the use of digital platforms for family-based medication reminders; and (5) the establishment of peer support groups for families of TB patients, as recommended by the WHO End TB Strategy [34].

Mariani et al. (2022) proved through the TB Family Support Training (TB FaST) program that family training significantly improves TB treatment adherence (OR=4.7; $p=0.002$), confirming that family-based interventions are an effective strategy. Nindrea et al. (2025) in the journal Africa found that patients tend to prioritize treatment when family members are actively involved in supervision and motivation. Yuliastina et al. (2025) explain that family involvement in medication supervision significantly reduces forgetfulness and

intentional non-adherence to medication. (29)
(31) (32) .

The managerial implications of this finding are very strategic for health centers. This condition provides an opportunity to strengthen the role of the family in supporting TB treatment adherence. The Baloi Permai Health Center needs to develop a structured TB family strengthening program, including: (1) family education sessions at least once per month in the format of TB patients' family classes; (2) family PMO training using standardized modules based on TB FaST; (3) periodic home visits by community nurses to monitor compliance and family support; (4) the use of digital platforms (WhatsApp groups or TB care applications) for family-based medication reminders; and (5) the formation of peer support groups for families of TB patients. This strategy is in line with the recommendations of the WHO End TB Strategy 2023, which emphasizes the importance of a community- and family-based approach. (33)

Effect of Attitude on OAT Drinking Adherence

Patients' attitudes towards TB treatment showed a significant influence in bivariate analysis ($p=0.043$); however, this association was no longer statistically significant in the multivariable analysis. This phenomenon can be explained by a suppressor effect in regression analysis, whereby the influence of attitudes on compliance is absorbed by family support variables that have greater predictive power. Theoretically, this is consistent with the Health

Belief Model (HBM), which states that internal perceptions (attitudes, beliefs, self-efficacy) are important predictors of health behaviors, but can be moderated by strong social environmental factors such as family support. When family support is high, it provides external motivation that replaces or strengthens the patient's internal motivation to obey. (34)

Common negative attitudes found in the field include: the notion that TB treatment is too long and burdensome, the perception that the side effects of OAT are unbearable, the belief that feeling healthy means it is okay to stop taking the medication, and the social stigma associated with TB diagnosis that causes patients to hide status and avoid routine check-ups. Nabila (2023) in her literature review, identified negative attitudes as a risk factor for OAT non-compliance that was consistently found in various studies. (18,19) (6)

Khoda et al. (2026) in an evaluation study in India found that positive attitudes towards treatment, particularly beliefs about the ability to cure TB, were significant independent predictors of adherence. Putri et al. (2023) reported that psychological distress related to negative attitudes towards disease was related to non-adherence to TB treatment in Banjar Village. Therefore, attitude change interventions through motivational interviewing counseling, HBM-based structured health education, and behavior change communication (KPP) by health workers need to be strengthened in parallel with

strengthening family support at the Baloi Permai Health Center. (35) (36)

Knowledge, Actions, and Roles of Health

Workers

The variables of knowledge ($p=0.312$), action ($p=0.214$), and role of health workers ($p=0.587$) did not show a significant influence on either bivariate or multivariate analysis. The insignificance of knowledge variables can be explained through the concept of knowledge-attitude-practice (KAP) gap, where good knowledge is not always directly correlated with action or obedience without the mediation of motivational and social factors. In this study, most of the respondents were knowledgeable, so the variation in knowledge between respondents was not large enough to explain the difference in compliance. Hasina et al. (2023) also found a similar thing, where in populations with secondary to upper education levels, knowledge is not always directly correlated with compliance because motivation and social support factors are more dominant. (37) (24)

The insignificance of the action variable ($p=0.214$) in the multivariate analysis was closely related to the distribution of mostly good categories, so the variation in actions between respondents was too narrow to explain the difference in compliance. Nonetheless, a study by Achhami et al. (2023) in Nepal found that good preventive health measures such as routine control and taking medication on schedule are important mediators between knowledge/attitudes and adherence to TB

treatment in longitudinal analysis. Therefore, the improvement of patient actions still needs to be maintained through periodic monitoring by PMO. (38)

The insignificance of the role of health workers is related to the ceiling effect: 88.0% of respondents consider the role of health workers to be good, so this very small variation is not able to explain the difference in compliance between respondents. Kaumba et al. (2024), in a study in Zambia found that when health workers have provided optimal services, family and community factors become more determinant of medication adherence. Nasrullah et al. (2023), in a systematic review and meta-analysis, showed that the quality of health workers' services had an indirect effect on compliance through strengthening patient self-efficacy and treatment-related quality of life. Although not statistically significant in this study, optimizing the role of health workers is still crucial as a catalyst in facilitating and optimizing effective family support, in accordance with the function of health centers as primary TB program management centers. (39) (40)

Determinant Model of TB Treatment Compliance

The determinant model of TB treatment adherence produced by this study showed that of the five variables tested, family support was the only determinant that survived in the final model of logistic regression with a Nagelkerke value of $R^2=0.618$. This means that 61.8% of the variability of OAT drinking compliance at the Baloi Permai Health Center can be explained by

family support through this model. This model is consistent with the WHO's framework on factors affecting medication adherence, which categorizes the determinants of adherence into five dimensions: patient-related factors, therapy-related factors, socio-economic condition-related factors, health system-related factors, and disease-related factors. Family support is in the dimension of socio-economic factors that are proven to have a stronger influence than individual factors in the context of this study. This has practical implications that are very important for the management of TB programs in health centers. (33)

Adejumo et al. (2025), in the development of MMAS (Morisky Medication Adherence Scale) found that the strongest predictor of long-term adherence to chronic disease is a social support system – especially families that provide consistent reminders and supervision. Sugiarto et al. (2018) and Herdianti et al. (2020) in previous studies on the TB population in Batam also found that interpersonal factors and social support are important predictors of TB-related health behaviors. The findings of this study confirm and expand the literature by proving through multivariate analysis that family support is the strongest single determinant in the OAT drinking adherence model in urban areas of the archipelago. (41) (37,42)

The policy implications of this model are very clear: TB management programs at Baloi Permai Health Center and similar health centers

in Batam City must transform the approach from a patient-centered approach to a family-based approach. Fadillah et al. (2025) recommend that effective TB interventions should involve the entire family as an intervention unit, not just the TB patient as an individual. This approach is in line with the concept of (43) *family-centered care* and *community-based TB management* (44,45), which is currently being encouraged by WHO and the Indonesian Ministry of Health in the National Strategy for TB Control 2024-2028.

Research Limitations

This research has several limitations. First, the cross-sectional design limits the ability to draw conclusions of causality between variables. Second, compliance measurement based on independent reports has the potential to contain social desirability bias. Third, the scope of research is only in one health center, so the generalization of results requires caution. Fourth, other variables that have the potential to affect compliance (distance to health centers, OAT side effects, comorbidity conditions, and economic factors) have not been included in the model. Advanced research with a longitudinal cohort design, objective compliance measurement (pill count or MEMS cap), multi-health center coverage, and structural equation model (SEM) is highly recommended to produce a more comprehensive determinant model.

CONCLUSION

This study concluded that family support was the main determinant and the most dominant determinant of OAT adherence among

pulmonary TB patients at the Baloi Permai Health Center, Batam City. The logistic regression model showed that Family Support is the dominant factor in a locally based determinant model that can be used as a reference in TB program planning in urban areas of the archipelago. Patients who received good family support were more than six times more likely to comply with TB treatment than those who did not receive adequate support. However, given that this study used a cross-sectional *design*, the interpretation of the results only showed the strength of the statistical association between family support and OAT adherence, not the cause-and-effect relationship. Patients' attitudes were also shown to have an effect at the bivariate analysis stage, indicating the need for intervention to change attitudes in parallel with strengthening family support.

Strengthening family involvement must be a core component in the TB program management strategy in health centers, implemented through structured family education, optimizing the role of PMO from families, periodic home visits, and the use of digital technology for family-based compliance monitoring. These findings can serve as a scientific basis for primary health policymakers in Batam City in designing TB program interventions that are more effective, efficient, and sustainable, especially in the context of urban areas of the archipelago with high population mobility characteristics.

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