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Factors Influencing Medication Adherence Among Children and Adolescents with Tuberculosis

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Abstract

Background: Tuberculosis (TB) remains a major global health challenge, particularly in low-resource and geographically isolated areas such as Papua, Indonesia. Medication adherence among children and adolescents is crucial to achieving successful treatment outcomes and preventing drug resistance. However, adherence rates remain suboptimal due to various individual, familial, and healthcare-related factors. This study aimed to identify factors associated with medication adherence among children and adolescents with TB undergoing treatment at the Agats Public Health Center, Asmat Regency, South Papua.. **Methods:** A quantitative analytical observational study with a cross-sectional design was conducted from November to December 2024. The study included all 35 pediatric and adolescent TB patients registered at the health center, using a total sampling technique. Data were collected through validated questionnaires measuring knowledge, attitude, family support, the role of healthcare workers, and medication adherence using the Morisky Medication Adherence Scale (MMAS-8). Data were analyzed using univariate and bivariate analyses with the Chi-square test at a 95% confidence level ($p \leq 0.05$). **Results:** Most respondents had low knowledge (77.1%), negative attitudes (85.7%), and poor family support (77.1%), while the majority perceived the role of healthcare workers as good (82.9%). Significant associations were found between knowledge ($p = 0.033$), attitude ($p = 0.000$), and the role of healthcare workers ($p = 0.000$) with medication adherence. Family support was not significantly associated with adherence ($p = 0.068$). **Conclusion:** Knowledge, attitude, and the role of healthcare workers significantly influence medication adherence among children and adolescents with TB. Although family support was not statistically significant, it remains an important contextual factor. Strengthening community-based health education, enhancing healthcare worker engagement, and empowering families are recommended to improve treatment adherence and outcomes, particularly in remote settings such as South Papua.

Keywords: Attitude, family support, health worker, medication adherence, tuberculosis.

1. Introduction

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* and remains one of the major global health problems (Bloom et al., 2017). This disease primarily affects the lungs but can spread to other organs, making it one of the leading causes of death from infectious diseases worldwide (Swinkels et al., 2025). According to the Global Tuberculosis Report, the number of TB cases globally increased to 10.6 million in 2021, indicating that the COVID-19 pandemic has slowed down global efforts to control TB transmission (Swinkels et al., 2025).

Indonesia ranks among the top three countries with the highest TB burden in the world, along with India and China (Eriansyah et al., 2025; Pai & Memish, 2017; WHO, 2024). In 2021, there were 33,366 TB cases among children (Mufti & Astutik, 2024; UNICEF, 2022), with the proportion of pediatric cases ranging from 7.9% to 12% of all TB cases (Irnawati et al., 2022; Lestari et al., 2022). This shows that children remain a highly vulnerable group requiring special attention in TB control efforts.

According to the Basic Health Research Survey, the prevalence of pulmonary TB in Indonesia was 0.42%, with Papua Province recording the highest rate at 0.77% (Ariska et al., 2025; Maharani et al., 2022). Papua, including Asmat Regency, faces specific challenges in TB control due to geographical isolation, limited healthcare infrastructure, and low public awareness of the importance of completing treatment (Diefenbach-Elstob et al., 2017; Maha et al., 2024; Ruru et al., 2018). Data from the Asmat District Health Office (2023) show that TB cases have continued to increase—from 261 in 2021 to 507 in 2023. The majority of cases were found in hospitals (268 cases) and at Agats Public Health Center (73 cases).

Specifically among children, the Agats Health Center reported 16 TB cases, consisting of 6 boys and 10 girls. Children in Papua are at higher risk of developing severe TB forms, such as miliary TB and TB meningitis, which can lead to serious

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complications or even death (Foster et al., 2023; Widyakusuma et al., 2024). This situation is exacerbated by low medication adherence among pediatric TB patients (Fekadu et al., 2020; Lemma Tirore et al., 2024; Maulana et al., 2025). Many children fail to complete treatment due to various factors, such as adverse drug effects, treatment fatigue caused by long therapy duration (6–12 months), limited family support, and lack of direct supervision from healthcare workers (Gao & Luo, 2024; Kvarnström et al., 2021; Li et al., 2023; Singh et al., 2023).

Socioeconomic and educational factors also play a significant role. In remote areas of Papua, misconceptions about TB persist, leading families to delay seeking medical care or discontinue treatment prematurely (Lahdji et al., 2022; Sari, 2025). Additionally, shortages of healthcare personnel and transportation barriers to health facilities further reduce treatment adherence (Chapman et al., 2025).

Non-adherence to TB treatment leads to serious consequences, including low recovery rates (Katende-Kyenda, 2025), increased relapse risk, and the emergence of drug-resistant strains (Multi-Drug Resistant TB or MDR-TB), which are more difficult and costly to treat (Tiberi et al., 2022; Wotale et al., 2024; Zereabruk et al., 2024). According to Siallangan et al. (2023), patient adherence to TB medication is influenced by multiple factors, including knowledge, attitude, family support, and the role of healthcare providers (Article et al., 2025; Dana et al., 2025; Harahap et al., 2025; Sazali et al., 2023).

Based on these conditions, this study aims to analyze the factors influencing medication adherence among children and adolescents with TB at the Agats Health Center, Asmat Regency, South Papua. The findings are expected to serve as a foundation for developing more effective interventions to improve TB treatment outcomes among children in geographically and socially challenging areas such as Papua.

2. Materials and Methods

2.1. Study Design

This study employed a quantitative analytical observational design with a cross-sectional approach. Quantitative research is objective in nature, encompassing data collection and statistical analysis (Sugiyono, 2017). The cross-sectional approach observes the relationship between risk factors and outcomes at a single point in time (Notoatmodjo, 2014). This design was used to identify factors influencing medication adherence among children with tuberculosis (TB).

2.2. Study Location

The study was conducted at the Agats Public Health Center (Puskesmas Agats), Asmat Regency, South Papua Province. Data collection was carried out between November and December 2024

2.3. Population and Sample

The population in this study consisted of all pediatric and adolescent patients diagnosed with tuberculosis (TB) who were undergoing treatment at the Agats Public Health Center (Puskesmas Agats), Asmat Regency, totaling 35 individuals. All members of the population were included as study participants using a total sampling technique, as the population size was relatively small and all respondents met the research criteria.

The sample was selected based on predetermined inclusion and exclusion criteria. The inclusion criteria included children and adolescents aged 0–19 years who were diagnosed with TB and undergoing treatment at Puskesmas Agats, willing to participate by signing an informed consent form provided by their parents or guardians, and able to communicate effectively either directly or through their caregivers.

The exclusion criteria included respondents or parents/guardians who refused to participate in the study, TB patients with severe comorbid conditions such as severe mental disorders or TB complications that could affect their ability to respond to the questionnaire, and respondents who failed to complete the questionnaire in full. The application of these criteria ensured that the collected data accurately represented the study population and maintained good validity.

2.4. Research Instruments

Data were collected using structured questionnaires, including:

1. Informed Consent Form – obtained from each respondent prior to participation.
2. Knowledge Questionnaire – consisting of 8 items (5 positive and 3 negative) rated on a four-point Likert scale (Strongly Agree to Strongly Disagree). Categorization was based on median values: low (< median) and high (≥ median).
3. Attitude Questionnaire – composed of 8 statements (4 positive and 4 negative), with responses marked as true or false. Scores were categorized as negative (< median) and positive (≥ median).
4. Family Support Questionnaire – adapted from Nursalam et al. (2009) , comprising 20 items rated on a four-point frequency scale (Always to Never), with reversed scoring for negative statements.
5. Health Worker Role Questionnaire – consisting of 6 items using a four-point Likert scale (Always to Never). Scores were categorized as poor (< median) and good (≥ median).
6. Medication Adherence Questionnaire (MMAS-8) – using the validated Morisky Medication Adherence Scale (Papeo et al., 2021), with a Cronbach's alpha of 0.866.

2.5. Data *Collection, Processing, and Analysis*

Data were analyzed using univariate and bivariate methods. The univariate analysis was conducted to describe the distribution and characteristics of each research variable through frequency tables and descriptive summaries. Subsequently, a bivariate analysis was performed to examine the relationship between independent variables—such as knowledge, attitude, family support, and the role of health workers—and the dependent variable, namely medication adherence. The Chi-square test was used for categorical data, and variables that showed a significance value of $p < 0.25$ were considered potential candidates for further analysis. The level of statistical significance was set at $p \leq 0.05$

3. Results

A total of 35 children and adolescents with tuberculosis (TB) who were undergoing treatment at Agats Public Health Center participated in this study. Table 1 presents the distribution of respondents based on demographic characteristics and research variables.

Table 1. Distribution of Respondents Based on Age, Gender, and Education (n = 35)

Variable	Category	f	%
Age	0–10 years	10	28.6
	11–14 years	13	37.1
	15–19 years	12	34.3
Gender	Male	18	51.4
	Female	17	48.6
Education	Not yet in school	6	17.1
	Kindergarten	3	8.6
	Elementary school	11	31.4
	Junior high school	9	25.7
	Senior high school	6	17.1

Most respondents were aged 11–14 years (37.1%) and male (51.4%). The majority attended elementary school (31.4%), indicating that most participants were in the school-age group with basic education levels.

Table 2. Relationship Between Knowledge, Attitude, Family Support, and Health Worker Role with Medication Adherence (n = 35)

Variable	Category	f	%	Non-Adherent n (%)	Adherent n (%)	p-value
Knowledge	High	8	22.9	5 (62.5)	3 (37.5)	**0.033**
	Low	27	77.1	25 (92.6)	2 (7.4)	
Attitude	Positive	5	14.3	1 (20.0)	4 (80.0)	**0.000**
	Negative	30	85.7	29 (96.7)	1 (3.3)	
Family Support	Good	8	22.9	5 (62.5)	3 (37.5)	0.068
	Poor	27	77.1	25 (92.6)	2 (7.4)	
Health Worker Role	Good	29	82.9	25 (86.2)	4 (13.8)	**0.000**
	Poor	6	17.1	5 (83.3)	1 (16.7)	

Most respondents had low knowledge (77.1%), negative attitudes (85.7%), and poor family support (77.1%), though most perceived the health worker's role as good (82.9%). The Chi-square test revealed significant relationships between knowledge ($p = 0.033$), attitude ($p = 0.000$), and health worker role ($p = 0.000$) with medication adherence. Conversely, family support did not show a statistically significant association ($p = 0.068$).

4. Discussion

The results of this study indicate that the level of medication adherence among children and adolescents with tuberculosis (TB) undergoing treatment at Agats Health Center, Asmat Regency, South Papua, remains relatively low. Several factors contribute to this adherence, including knowledge, attitude, family support, and the role of healthcare workers. These four factors provide a comprehensive overview of patient adherence behavior toward anti-tuberculosis therapy.

Based on the analysis, most respondents (77.1%) had a low level of knowledge about TB. Poor knowledge led patients to misunderstand the importance of consistent treatment and the potential consequences of discontinuing therapy, such as drug resistance. Statistical analysis showed no significant relationship between knowledge and adherence (p=0.033). This finding differs from Nuraeni et al. (2022); Tachfouti et al. (2012), who reported a positive association between knowledge and treatment adherence among TB patients in the Philippines. The difference may be due to limited access to health information in remote areas such as Agats. Therefore, increasing knowledge through community-based health education and the use of simple visual media is crucial to improving patients' understanding. This finding aligns with Notoatmodjo (2020), who emphasizes that knowledge serves as the foundation for shaping health behavior.

Attitude was also found to have a significant effect on treatment adherence (p=0.000). Most respondents (85.7%) had a negative attitude toward TB therapy. Negative attitudes may stem from treatment fatigue, lack of trust in drug efficacy, or fear of side effects. This finding supports Notoatmodjo (2020) health behavior theory, which states that attitude is an important predisposition influencing individual behavior. Similarly, Adini et al. (2023) found that patients with positive attitudes toward treatment were more likely to adhere to therapy. Interventions should include motivational counseling, emotional support, and the involvement of community leaders and healthcare workers to strengthen positive attitudes toward treatment.

Family support also plays an essential role in treatment success. The study found that most respondents (77.1%) had poor family support, and the relationship between family support and adherence was not statistically significant (p=0.033). Nevertheless, family support remains a key factor in treatment adherence. Milandari et al. (2023) found that good family support can enhance patient motivation and adherence to therapy. In the context of remote regions like Agats, limited family income and education can hinder their ability to provide optimal support. Thus, involving families in health education programs including short training sessions on the importance of treatment supervision—can enhance the family's role in improving patient adherence.

Healthcare workers also play a crucial role in ensuring TB treatment success. Although most respondents (82.9%) rated the role of healthcare workers as good, overall adherence remained low. This indicates a gap between patients' perceptions of health services and their actual behavior. Healthcare workers are vital in implementing the Directly Observed Treatment Short-course (DOTS) strategy, but geographical barriers, limited personnel, and poor transportation access in Papua may affect program effectiveness. Chavez-Rimache et al. (2023) found that involving community health volunteers in TB treatment monitoring significantly improved patient adherence. Therefore, collaboration among healthcare workers, community volunteers, and local residents is essential to strengthen supervision and health education at the community level.

Overall, this study emphasizes that TB treatment adherence among children and adolescents is influenced by individual factors (knowledge and attitude), social factors (family support), and healthcare system factors (role of healthcare workers). A comprehensive and sustainable intervention approach is necessary, including improving patient knowledge, fostering attitude change through motivational approaches, strengthening family involvement, and optimizing community-based health services. The implementation of such strategies is expected to enhance TB treatment success, particularly in remote areas like South Papua.

5. Conclusions

This study concludes that medication adherence among children and adolescents with tuberculosis (TB) at Agats Public Health Center, Asmat Regency, South Papua, remains suboptimal. The analysis revealed that knowledge, attitude, and the role of health workers were significantly associated with adherence, whereas family support did not show a statistically significant relationship, despite being an essential contributing factor.

Children and adolescents with higher knowledge levels, positive treatment attitudes, and strong engagement from healthcare workers were more likely to adhere to TB therapy. Conversely, limited access to health information, negative treatment perceptions, and logistical barriers in rural settings hindered adherence.

These findings have practical and policy implications for TB control in remote regions. Strengthening health education programs that use culturally adapted materials and visual aids can improve patient understanding. Integrating family-centered interventions—such as caregiver training and home-based supervision—can reinforce adherence behavior. Moreover, enhancing the capacity and outreach of healthcare workers through community-based collaboration, including the involvement of local volunteers, can overcome geographic and resource limitations.

At the policy level, this study supports the need for sustained government commitment to strengthen primary healthcare systems in remote areas like South Papua, ensuring continuity of care and equitable access to essential TB services. Future research should explore longitudinal and qualitative approaches to better understand behavioral determinants and design more effective interventions tailored to local contexts.

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Ethical considerations

This study was conducted in accordance with the ethical standards for research involving human participants. Ethical approval was obtained from the Health Research Ethics Committee of Universitas Graha Edukasi Makassar. All respondents provided

written informed consent prior to data collection. Anonymity and confidentiality were strictly maintained throughout the study, and no identifying information was disclosed in the final report.

Conflict of Interest
The authors declare no conflicts of interest

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