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Level of Treatment Adherence To The Effectiveness of Treating Pulmonary Tuberculosis In Children

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Abstract

Tuberculosis remains a major public health issue. This disease requires special attention because many people still neglect their medication routines. Tuberculosis treatment must be carried out regularly, considering its long duration, which sometimes results in many patients experiencing discontinuation of treatment. Low treatment adherence, especially in children, can lead to therapy failure and drug resistance. Therefore, it is necessary to investigate the factors influencing this failure. The purpose of this study was to analyze the relationship between the level of treatment adherence and the effectiveness of pulmonary tuberculosis treatment in children. The study population consisted of 322 children diagnosed with tuberculosis, selected through consecutive sampling, resulting in 30 respondents. The instruments used in this study were a questionnaire validated by experts to obtain information on risk factors, and medical records to obtain information related to pulmonary tuberculosis treatment in children. The collected data were analyzed using the Spearman rank test. The results of the study showed that the level of compliance with pulmonary TB treatment in children at Husada Prima Surabaya Regional Hospital was mostly in the non-compliant category, namely 20 children (66.7%), which indicates the still low discipline in undergoing treatment according to the schedule and medical instructions. Meanwhile, the effectiveness of pulmonary TB treatment in children was mostly in the ineffective category, namely 14 children (46.7%), which reflects the less than optimal treatment results in terms of clinical aspects and improvement in children's health status.

Keywords : Treatment Compliance Level, Tuberculosis Management, Children

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Introduction

Pulmonary tuberculosis (TB) in children is a global health problem that requires special attention, especially in countries with a high TB burden such as Indonesia (WHO, 2023). Medication adherence is a key factor in the success of therapy, given the long duration of treatment, which is a minimum of 6 to 12 months, as well as the child's dependence on caregivers in administering medication (Murray et al., 2020). Low adherence can lead to drug resistance, therapy failure, and increased morbidity and death rates (WHO, 2021). Various factors such as drug side effects, lack of parental understanding, social stigma, and economic burden also contribute to non-adherence to treatment (Sari et al., 2022). Although DOTS strategies have been implemented to ensure patient compliance, its success relies heavily on the role of families, healthcare workers, and community support (CDC, 2023). Therefore, a deeper understanding of the factors that affect TB treatment adherence in children is needed to improve the effectiveness of existing interventions.

Based on data from the WHO (2022), about 10% of all global TB cases occur in children, with more than half coming from transmission in the household environment. This condition confirms the importance of examining the risk factors that affect the spread of Mycobacterium Tuberculosis, especially in vulnerable age groups such as children. In Indonesia, unhealthy home conditions, such as high humidity, poor ventilation, and excessive occupancy density, are still a significant problem in the

spread of tuberculosis. Children living in such environments face a higher risk of infection, especially if they have weakened immune systems due to malnutrition or comorbidities such as HIV. Research by Rahmadani et al. (2023) shows that houses with poor ventilation and inadequate sanitation increase the

risk of TB transmission by up to 40% compared to houses with healthy conditions. These factors suggest that prevention efforts must include improving the condition of the home environment as well as strengthening children's immunity through appropriate nutritional interventions.

In addition to environmental factors, internal factors such as children's health status also play a role in susceptibility to TB infection. Children with malnutrition, especially those living in areas with limited access to health services, have a higher risk of infection. Research by Wahyuni et al. (2024) found that the prevalence of tuberculosis in children with malnourished status reached 25% higher than children with good nutrition. Therefore, adequate nutrition interventions and affordable health services are important components in reducing the incidence of tuberculosis in children.

Other external factors that contribute to TB transmission are parental education levels and access to health services. A study by Nugroho et al. (2025) showed that community-based interventions involving home ventilation improvements and health education succeeded in reducing the rate of TB infections in children by up to 15% within one year. Another study by Handayani et al. (2023) found that inadequate natural lighting can prolong the survival of airborne TB bacteria by up to 30% longer, increasing the risk of infection.

Previous studies have highlighted a lot of the relationship between home environmental factors and the incidence of tuberculosis in children. However, there is still a gap in understanding the mechanisms of interaction between environmental factors such as ventilation, humidity, and lighting to the risk of TB infection in children. Therefore, this study aims to analyze the relationship between the level of treatment adherence and the effectiveness of treating pulmonary tuberculosis in children in hospitals. The results of this study are expected to contribute to the development of more effective TB treatment strategies.

Research Methods

This study used a *cross-sectional quantitative design* with a correlational approach to analyze the relationship between treatment adherence and the effectiveness of treating Pulmonary Tuberculosis in children. The population in this study is all children treated at Husada Prima Surabaya Hospital with a diagnosis of post-BTA and negative BTA Pulmonary Tuberculosis aged 1-14 years from January to November 2024 is 322 children. This study involves samples that meet the inclusion and exclusion criteria that have been set. The inclusion criteria set by the researcher are children aged 1-14 years who are diagnosed with BTA positive and BTA negative pulmonary TB, children who receive treatment in accordance with the pulmonary TB treatment protocol in the hospital, children who have been given Antituberculosis treatment for at least 1 month, children who have sufficient health status to participate in the study, children who have a history or contact with active pulmonary TB patients, and a patient's parent/guardian who is willing to give consent to participate in the study. The sample selection was carried out by *consecutive sampling* so that there were 30 respondents who would participate in the study.

This research was conducted at Husada Prima Hospital Surabaya, with data collection carried out in inpatient rooms and polyclinics. This research has received an ethical permit from the University of Muhammadiyah Gresik No.

The instruments used in this study are questionnaires that have been validated by experts to explore information about risk factors, as well as medical records to find out information related to the

treatment of pulmonary TB in children. The results of the data collected will be analyzed using the spearman rank test analysis to determine the relationship between treatment adherence and the effectiveness of treating pulmonary tuberculosis in children.

Results and Discussion

Table 1. Cross-tabulation of Compliance with the Effectiveness of Pulmonary TB Treatment in Children at Husada Prima Hospital, March 2025

No	Effectiveness	Compliance			Total
		Non-compliant	Simply Obey	Obedient	
1	Ineffective	14	0	0	14
2	Quite Effective	5	2	0	7
3	Effective	1	6	2	9
	Total	20	8	2	30

Based on cross-tabulation between the level of compliance and the effectiveness of treatment of pulmonary tuberculosis in children at Husada Prima Hospital in March 2025, it is known that all respondents who are included in the ineffective category (as many as 14 children) are all from the non-compliant group. Meanwhile, in the category of quite effective, there were 5 children who were not obedient and 2 children who were quite obedient. As for the group with high (effective) treatment effectiveness, the majority came from the moderately obedient (6 children) and obedient (2 children) groups, with only 1 child who did not comply. These findings show a positive and consistent relationship between the level of adherence to treatment and the effectiveness of treating pulmonary TB, where the higher the level of adherence, the greater the likelihood of achieving treatment effectiveness.

The results of data analysis using the Spearman correlation test showed that there was a significant relationship between the level of compliance and the effectiveness of treatment in Pediatric Pulmonary TB. The value of the Spearman correlation coefficient was 0.762 with a significance value of $p = 0.000$ ($p < 0.01$), indicating that the relationship is in the strong and statistically significant category, meaning that the higher the level of child adherence, the more effective the treatment of pulmonary TB.

The results of the study showed that most of the children with Pulmonary TB at Husada Prima Hospital Surabaya in March 2025 were classified as non-compliant in undergoing treatment, namely 20 children (66.7%), while those classified as quite compliant as many as 8 children (26.7%), and only 2 children (6.7%) showed full compliance. Medication adherence is one of the main determining factors for the success of TB therapy, especially in children. According to Nursalam (2020), the level of patient compliance is greatly influenced by the perception of the disease, the understanding of parents or caregivers of the importance of taking medication regularly, and the support of family and health workers. In addition, research by Maulana et al. (2021) stated that TB treatment adherence in children is influenced by age factors, parental education, clarity of information provided by health workers, and daily medication administration routines which often cause disturbing side effects. WHO (2023) also emphasizes the importance of an individualized approach and ongoing education of caregivers in improving medication adherence in children with TB.

The low level of treatment adherence in this study is very worrying, considering that the consequences can be in the form of therapy failure, relapse, and even drug resistance (MDR-TB). These findings indicate that a thorough evaluation of the monitoring and compliance support system at Husada

Prima Hospital needs to be carried out, including increasing the active role of health workers in education, therapeutic communication, and family assistance during the therapy period. In addition, cross-sectoral involvement such as TB cadres in the community also needs to be strengthened to assist families in ensuring that treatment is carried out consistently and completely.

Meanwhile, the effectiveness of treating Pulmonary TB in children at Husada Prima Surabaya Hospital in March 2025 shows that as many as 14 children (46.7%) received ineffective treatment, 7 children (23.3%) were classified as quite effective, and only 9 children (30.0%) were considered to receive very effective treatment. This occurs in the midst of the condition that the majority of children are new cases (100%), with no comorbidities (90%), and most have undergone treatment for 4-6 months (90%). However, the rate of treatment adherence in most children is still low (66.7% non-compliant), which can be one of the contributing factors to ineffective treatment.

The effectiveness of treating pediatric TB is greatly influenced by the success of therapy as seen from weight gain, reduced complaints, medication adherence, and laboratory test results (Nursalam, 2020). According to the theory of health system effectiveness by Jeyaraj (2020), the success of a clinical intervention is influenced by a combination of service quality, patient participation, and clinical outcomes. In addition, the results of a study by Indriani et al. (2021) stated that the effectiveness of treating childhood TB will increase if there is consistent supervision of medication use, good communication between officers and families, and supportive psychosocial approaches. Ineffective treatment of TB is usually rooted in inconsistent treatment, poor clinical monitoring, and a lack of parental understanding of the importance of thorough therapy.

The low proportion of effective treatment of childhood TB found in this study shows that although services have reached new cases comprehensively, not all children have received the maximum benefit from the treatment process. This is most likely due to the high level of non-compliance and the weak involvement of families in supporting the success of child therapy. Therefore, researchers are of the view that increasing effectiveness is not enough only through regular drug administration, but also needs to be supported by continuous health education for parents, daily compliance monitoring, and a comprehensive evaluation of the pediatric TB service system that includes clinical, educational, and psychosocial aspects in an integrated manner.

According to Nursalam (2020), compliance is the main factor that affects the effectiveness of TB treatment, especially in children who are highly dependent on the role of family or caregiver. Children who adhere to regular medication on schedule have a greater chance of experiencing clinically meaningful improvement, including weight gain, symptom relief, and prevention of drug resistance. Research by Sari et al. (2021) also states that there is a meaningful relationship between treatment adherence and the success of pediatric TB therapy, where low adherence increases the risk of treatment failure or prolongation. In the DeLone & McLean model approach in Jeyaraj (2020), compliance is also included in the individual factors that contribute to the effectiveness of the healthcare system as a whole.

The results of this study are in line with previous theories and studies, which show that compliance plays a major role in determining the effectiveness of treating pediatric pulmonary TB.

The researcher assessed that the ineffective condition experienced by almost half of the respondents was rooted in the lack of supervision of daily drug consumption, the lack of family understanding of the consequences of incomplete therapy, and the lack of optimal repeated education from health workers. Therefore, the researcher suggests the need for family-based compliance improvement strategies, including strengthening the medication monitoring system (PMO), the use of pediatric TB cadres or companions, as well as an interpersonal communication approach between officers and parents to increase awareness and commitment to treatment success.

Conclusion

The conclusion obtained from this study is that the level of compliance with Pulmonary TB treatment in children at Husada Prima Hospital Surabaya is mostly in the non-compliance category, namely as many as 20 children (66.7%), which shows that there is still low discipline in undergoing treatment according to the schedule and medical instructions. Meanwhile, the effectiveness of treating pulmonary TB in children is mostly in the ineffective category, namely 14 children (46.7%), which reflects that treatment results are not optimal from the clinical aspect and the improvement of children's health status. This indicates that the higher the child's compliance in undergoing treatment, the higher the effectiveness of pulmonary TB treatment achieved. For the suggestions proposed by the researcher in the future, it is hoped that parents will be more active in ensuring that their children follow treatment completely and on time, as well as paying attention to the cleanliness and ventilation of the house. Parents are also urged to immediately check other family members if there are symptoms of chronic cough, in order to prevent the spread of TB more widely in the home environment.

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