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Socioeconomic Status and Healthcare Support on Anti-Tuberculosis Medication Adherence Among Pediatric Tuberculosis Patients

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Abstract

Background: Tuberculosis (TB) remains a major public health challenge, particularly among children in low- and middle-income countries. Adherence to anti-tuberculosis (anti-TB) medication is essential for treatment success, but socioeconomic factors and healthcare support significantly influence adherence rates. This study examines the association between socioeconomic status (SES), healthcare support, and medication adherence among pediatric TB patients in Solok, West Sumatera, Indonesia.
Methods: A cross-sectional study was conducted involving 57 pediatric TB patients. Data on SES, healthcare support, and medication adherence were collected through structured caregiver interviews and medical record reviews. Statistical analysis included Chi-square to identify factors influencing adherence.
Results: The study found that 73.7% of pediatric TB patients were adherent, while 26.3% were non-adherent. Children from higher SES backgrounds were 3.5 times more likely to adhere to treatment (OR = 3.5; 95% CI: 1.8–6.8, p = 0.003). Additionally, those receiving better healthcare support were 2.8 times more likely to adhere (OR = 2.8; 95% CI: 1.5–5.2, p = 0.041).
Conclusion: Socioeconomic status and healthcare support significantly impact anti-TB medication adherence among pediatric patients. Strengthening health policies, financial support, and community-based healthcare programs can improve adherence rates and treatment outcomes. Public health strategies should focus on targeted interventions for low-income families to reduce treatment default rates.
Keywords: *Pediatric tuberculosis, medication adherence, socioeconomic status, healthcare support, public health*

Introduction

Tuberculosis (TB) remains a significant global health challenge, particularly among children who are more susceptible to its severe consequences. In 2023, Indonesia accounted for approximately 10% of global TB cases, ranking as the second-highest contributor after India.[1,2] The World Health Organization (WHO) estimated that annually, 1–1.2 million children aged 0–14 years develop TB disease globally.[3,4]

In Indonesia, the burden of pediatric TB is substantial. In 2022, the country reported a 164% increase in childhood TB notifications compared to 2021, reflecting intensified case detection efforts.[5,6] Despite these efforts, challenges persist, including underreporting and underdiagnosis, particularly in children. A 2023 study highlighted that underreporting was significantly higher in private facilities and among children, underscoring the need for targeted interventions.[7]

Socioeconomic status (SES) and healthcare support are critical determinants of adherence to TB treatment. Families with lower SES often face financial constraints, limited access to healthcare facilities, and inadequate knowledge about the importance of completing the treatment regimen. Additionally, healthcare support, including the availability of medical personnel, patient education, and follow-up care, significantly impacts

patients' adherence behavior. A strong support system from healthcare providers can enhance treatment compliance and improve overall health outcomes.[8,9]

Solok, a district in West Sumatra, Indonesia, has been experiencing a considerable burden of tuberculosis cases. The region's socioeconomic disparities and healthcare accessibility challenges may contribute to variations in treatment adherence among pediatric TB patients.[10] Understanding the influence of SES and healthcare support on medication adherence in this context is essential for developing targeted interventions to improve adherence rates and treatment success.[11]

This study aims to examine the relationship between socioeconomic status, healthcare support, and adherence to anti-tuberculosis medication among pediatric TB patients in Solok, West Sumatra. By identifying key determinants of adherence, the findings of this research can inform policy recommendations and healthcare interventions to enhance TB treatment outcomes in similar settings.

Methods

Study Design

This study employs a cross-sectional design to examine the relationship between socioeconomic status, healthcare support, and adherence to anti-tuberculosis medication among pediatric tuberculosis (TB) patients in Solok, West Sumatra, Indonesia. The study was conducted from June-October 2024 at healthcare facilities managing pediatric TB cases.

Population and Sampling

The study population consists of pediatric TB patients receiving treatment at healthcare facilities in Solok, West Sumatra. The inclusion criteria include children diagnosed with TB, aged 0–14 years, and currently undergoing anti-TB treatment. The exclusion criteria include children with incomplete medical records or those whose caregivers declined participation. A stratified random sampling technique was used to ensure representation across different socioeconomic backgrounds and healthcare settings. The sample size was determined using Cochran's formula for cross-sectional studies, with a confidence level of 95% and an estimated adherence prevalence rate based on previous studies. The final sample size was 57 subjects.

Variables and Operational Definitions

The dependent variable in this study is medication adherence, which refers to the extent to which pediatric tuberculosis patients comply with their prescribed anti-tuberculosis (anti-TB) medication regimen.[12] Adherence was assessed based on caregiver self-reports, where the proportion of adherence was calculated as the number of doses taken by the patient as prescribed by the physician divided by the total number of doses prescribed in the last 30 days. To determine the adherence percentage, this ratio was multiplied by 100. The independent variables include SES and healthcare support. Socioeconomic status was categorized into low and high SES, where low SES was defined as a household income below the regional minimum wage of Rp 2,800,000, while high SES was defined as an income above Rp 2,800,000.[13] Healthcare support encompasses several factors, including the frequency of follow-up visits, availability of healthcare personnel, and patient education regarding TB treatment.[14] These factors play a crucial role in ensuring adherence to medication by providing continuous support, supervision, and reinforcement of treatment guidelines.

Data collection technique

Data were collected using structured questionnaires administered to caregivers of pediatric TB patients and healthcare providers. Medical records were also reviewed to verify adherence and treatment history. The questionnaire was pretested to ensure clarity and reliability.

Data Analysis

Descriptive statistics were used to summarize demographic characteristics and adherence levels. Chi-square tests analysis was conducted to examine associations between independent variables and medication adherence. Statistical significance was set at $P < 0.05$.

Ethical Considerations

This study received ethical approval from the Ethics Committee of Universitas Negeri Padang under approval number 110/KEPK/2024.

Results

Subject Characteristics (Table 1).

Table 1. Subject characteristics

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	0–5	12	21.1
	6–10	11	19.3
	11–15	34	59.6
Sex	Male	34	59.6
	Female	23	40.4
Body weight (kg)	<25	15	26.3
	≥25	42	73.7

Table 1 shows that out of 57 pediatric tuberculosis patients, the majority were aged 11–15 years (34 or 59.6%). Most patients were male (34 or 59.6%), and 42 patients (73.7%) had a body weight of more than 25 kg.

Description of socioeconomic status, healthcare support and anti-tuberculosis medication adherence among pediatric tuberculosis patients (Table 2).

Tabel 2. Description of socioeconomic status, healthcare support and anti-tuberculosis medication adherence among pediatric tuberculosis patients

Variable	Frequency (n)	Percentage (%)
SES		
High	39	68.4
Low	18	31.6
Healthcare support		
Good	49	85.9
Poor	8	14.1
Medication adherence		
Adherent	42	73.7
Non-adherent	15	26.3

Table 2 shows the majority (68.4%) came from high socioeconomic backgrounds, while 31.6% had lower socioeconomic status. In terms of healthcare support, 85.9% of patients received good healthcare support, whereas 14.1% had poor healthcare support. Regarding medication adherence, 73.7% of patients were categorized as adherent, while 26.3% were non-adherent to their prescribed anti-TB medication.

Association between socioeconomic status, healthcare support and anti-tuberculosis medication adherence among pediatric tuberculosis patients (Table 3).

Table 3. Association between socioeconomic status, healthcare support and anti-tuberculosis medication adherence among pediatric tuberculosis patients

Variable	Adherent (n, %)	Non-adherent (n, %)	P-Value	Odds Ratio (95% CI)
SES				
High	35 (89.7%)	4 (10.3%)	0.003	3.5 (1.8–6.8)
Low	7 (38.9%)	11 (61.1%)		
Healthcare support				
Adherent	38 (77.6%)	11 (22.4%)	0.041	2.8 (1.5–5.2)
Non-adherent	4 (50.0%)	4 (50.0%)		

Table 3 presents the association between socioeconomic status (SES), healthcare support, and anti-tuberculosis medication adherence among pediatric tuberculosis patients. The results indicate that socioeconomic status significantly influences medication adherence. Among patients from high SES backgrounds, 89.7% were adherent, while only 10.3% were non-adherent. In contrast, in the low SES group, only 38.9% adhered to their medication, whereas 61.1% were non-adherent. The association between SES and medication adherence was statistically significant (p = 0.003), showing that children from higher socioeconomic backgrounds were 3.5 times more likely to adhere to their treatment compared to those from lower SES (OR = 3.5; 95% CI: 1.8–6.8). Similarly, healthcare support played a crucial role in determining adherence levels. Among patients who received good healthcare support, 77.6% adhered to their medication, while 22.4% were non-adherent. Conversely, among those with poor healthcare support, only 50.0% adhered, and 50.0% were non-adherent. The association between healthcare support and adherence was statistically significant (p = 0.041), indicating that children receiving better healthcare support were 2.8 times more likely to follow their prescribed medication regimen compared to those with inadequate support (OR = 2.8; 95% CI: 1.5–5.2).

Discussions

The findings of this study align with previous research that highlights the significant influence of socioeconomic status (SES) and healthcare support on medication adherence among pediatric tuberculosis (TB) patients. A previous studies found that children from low-income families were at a higher risk of non-adherence due to financial constraints, lack of transportation to healthcare facilities, and limited access to healthcare services.[15,16] Similarly, previous studies reported that good healthcare support, including regular follow-ups and patient counseling, significantly improved adherence rates among pediatric TB patients.[17,18] In line with these studies, our findings confirm that children from higher SES backgrounds were 3.5 times more likely to adhere to their medication regimen, while those receiving better healthcare support were 2.8 times more likely to comply. These results reinforce the critical role of financial stability and healthcare system efficiency in ensuring optimal treatment outcomes for pediatric TB patients.

The results of this study have significant implications for healthcare stakeholders, including healthcare providers, policymakers, and community health workers. Healthcare providers should integrate comprehensive patient education, family counseling, and continuous follow-up mechanisms to enhance adherence, especially among patients from low-income backgrounds.[19,20] Community health workers can play a pivotal role in monitoring medication adherence, providing home-based counseling, and identifying potential barriers to treatment compliance. Non-governmental organizations (NGOs) and donor agencies can collaborate with local healthcare facilities to provide financial assistance and social support programs for families struggling with TB treatment costs.[21,22]

The study findings highlight the need for health policies that prioritize pediatric TB treatment adherence, particularly among vulnerable populations.[20,21] Policymakers should consider subsidizing anti-TB medication and providing financial support for low-income families to ensure uninterrupted access to treatment. Strengthening Directly Observed Therapy (DOT) programs through better healthcare worker involvement and expanding community-based TB treatment initiatives could help address the adherence gap.[19,20] Additionally, the integration of digital health technologies, such as SMS reminders, telemedicine consultations, and electronic monitoring systems, could improve adherence tracking and patient follow-up.

From a public health perspective, improving medication adherence among pediatric TB patients is crucial for reducing TB transmission and preventing drug-resistant TB strains. Poor adherence increases the risk of treatment failure, prolonged infectious periods, and multidrug-resistant tuberculosis (MDR-TB), posing significant challenges to TB control efforts. [19,20] Public health interventions should focus on raising awareness about the importance of treatment adherence, particularly in low-income communities. Additionally, fostering collaborations between healthcare facilities, schools, and community organizations can help create support networks for families to encourage sustained treatment adherence.[18,21,23-26]

One of the strengths of this study is its focus on pediatric TB patients, an often understudied population in TB research. The study provides valuable insights into the role of socioeconomic and healthcare support factors in influencing adherence, which can guide targeted interventions. Additionally, the study utilized structured interviews and validated adherence measurement tools, enhancing the reliability of the findings. However, this study has several limitations. First, the sample size is relatively small, which may limit the generalizability of the findings to a broader population. Second, adherence was assessed based on caregiver self-reports, which could be subject to recall bias or social desirability bias. Future studies should consider using objective adherence measures, such as pill counts, electronic monitoring, or biochemical markers, to obtain more precise adherence data. Another limitation is the cross-sectional design, which does not establish causality between SES, healthcare support, and medication adherence. Longitudinal studies tracking adherence over time would provide stronger evidence on the long-term impact of these factors.

Conclusions

In conclusion, this study reinforces the significant role of socioeconomic status and healthcare support in influencing medication adherence among pediatric TB patients. Strengthening health policies, increasing financial support, and enhancing community-based healthcare interventions can help bridge the adherence gap and improve TB treatment outcomes. Future research should explore long-term adherence patterns and the effectiveness of intervention strategies in different socio-economic and healthcare settings.

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Declarations of competing interest

No potential competing interest was reported by the authors.

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