



## Empowering Families in Pediatric Tuberculosis Treatment: Enhancing Adherence through Education and Support

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### ABSTRACT

This research evaluates the effectiveness of a family empowerment program in improving medication adherence among children undergoing treatment for pulmonary tuberculosis (TB) in Desa Pangkalan Benteng, Indonesia. The study integrates qualitative and quantitative methods to assess the impact of a training program to increase family knowledge about TB and its treatment regimen. The results demonstrate a significant improvement in family knowledge and children's adherence to their treatment schedule after receiving education on medication management, side effect handling, and emotional support. The findings emphasize the critical role of family involvement in ensuring that children complete their treatment regimens and suggest that comprehensive family education programs can enhance treatment outcomes. The study highlights the potential of family-centered interventions in pediatric TB care and provides recommendations for expanding such programs to other chronic diseases.

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## 1. INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis*, which can affect various body organs but most commonly attacks the lungs. Pulmonary tuberculosis, the most frequently encountered type of TB, remains a significant global health problem, especially in developing countries like Indonesia [1], [2], [3]. In Indonesia, the prevalence of TB is still high, with a significant incidence among children, which requires special attention to treatment adherence and therapy [4], [5], [6]. Treating TB in children involves several antibiotics that must be taken regularly, usually for six months or more [4], [7]. Regular and timely therapy is crucial to ensure recovery and prevent further complications. However, adherence to treatment remains a major challenge, particularly among children who may not fully understand the importance of the treatment and find it difficult to take medication regularly [8], [9], [10]. Therefore, the role of the family in ensuring that children follow the treatment correctly is essential.

One of the main challenges in treating pediatric TB is the lack of medication adherence, which is mostly due to the family's limited understanding of the disease and treatment process [11], [12], [13], [14]. Many families face difficulties in ensuring their children follow TB treatment regularly. Another factor that exacerbates this situation is the limited knowledge of how to manage medication side effects and the lack of skills in assisting children during treatment. Hence, family empowerment is crucial to address these issues [15], [16], [17].

The primary goal is to increase family knowledge about TB and its treatment and improve children's adherence to treatment [18], [19]. Several studies have examined the importance of family involvement in supporting TB treatment. The role of the family in ensuring medication adherence is significant, and well-educated families have a higher chance of successfully assisting their children with the treatment process [20], [21], [22]. Additionally, family training on medication management and handling side effects has been shown to improve adherence to TB treatment among children [23], [24]. Another study emphasized the importance of family empowerment in enhancing the quality of life for children suffering from TB [25], [26].

A study titled *The Role of Family in Pediatric Tuberculosis Treatment Adherence* revealed that families who received education on TB treatment played a key role in improving medication adherence in children. In this study, families who actively participated in the treatment process achieved better treatment outcomes for their children [27],

[28]. Her research The Impact of Family Training on Pediatric TB Treatment Adherence concluded that structured family training on medication management and handling side effects can significantly improve adherence to TB treatment in children [29], [30], [31], [32]. This finding is highly relevant to the family empowerment program in this research. Another study titled Family Empowerment in Treating Pediatric Pulmonary Tuberculosis showed that family empowerment, which includes educating families about the disease and effective care techniques, can improve treatment outcomes and reduce complications in children [33], [34]. This study strengthens the argument that the role of the family is a determining factor in achieving patient recovery.

Family empowerment in supporting pediatric tuberculosis (TB) treatment has been a major focus of recent research. Studies have emphasized families' critical role in improving adherence to long and complex treatment regimens [35]. Various approaches, such as skill training, counseling, and emotional support, have been proven effective in helping families manage children's treatment [36], [37]. However, challenges such as resource limitations, social stigma, and inadequate access to health facilities remain significant barriers that must be addressed [38], [39]. This research will continue the efforts to evaluate the effectiveness of family empowerment programs, specifically in Desa Pangkalan Benteng. This research aims to evaluate the effectiveness of a family empowerment program in assisting children with Pulmonary Tuberculosis (TB) in adhering to their treatment regimen in Desa Pangkalan Benteng.

## 2. RESEARCH METHOD

The research method for this study is designed to evaluate the effectiveness of a family empowerment program in improving adherence to tuberculosis (TB) treatment in children. The study will follow a systematic approach consisting of several stages: data collection, intervention, and evaluation. The method is based on a mixed-methods design, integrating both qualitative and quantitative research approaches to provide a comprehensive understanding of the impact of the family empowerment program.

The first stage of the research involves data collection through a baseline survey that will assess the existing knowledge of families about TB and their current practices regarding medication adherence. Theoretical support for this phase comes from the Health Belief Model (HBM), which suggests that people's health behavior is influenced by their perceptions of the severity and susceptibility of a disease, as well as the benefits and barriers associated with acting. This study will assess the family's perception of the TB treatment process and their role in supporting medication adherence. In the intervention phase, the families will receive training sessions on the nature of tuberculosis, the importance of medication adherence, the management of side effects, and emotional support. This phase is grounded in the Social Cognitive Theory, which emphasizes learning from others through observational learning and reinforcing desired behaviors. The training will be designed to increase the families' self-efficacy in managing their children's TB treatment. This will include practical methods such as using reminders for medication schedules and managing side effects.

Finally, the evaluation phase involves measuring the outcomes of the intervention, including improvements in family knowledge, adherence to the treatment schedule, and the health outcomes of the children involved. This stage will involve qualitative interviews with the families and quantitative analysis through follow-up surveys to assess the program's effectiveness. The theory of planned behavior will be used in this stage to understand how attitudes, subjective norms, and perceived behavioral control influence the adherence behavior of families.

## 3. RESULTS AND ANALYSIS

### 3.1. Results

The data in this study will be presented in a structured format, utilizing tables, graphs, and narratives to ensure clarity and ease of understanding. The following tables and graphs will be included to present key findings:

**Table 1:** Baseline Family Knowledge on Tuberculosis (TB) and Medication Adherence.

Family Member	Knowledge Level (Pre-training)	Knowledge Level (Post-training)
Family A	Low	High
Family B	Medium	High
Family C	Low	Medium

Table 1 shows changes in family knowledge levels before and after the intervention.



**Table 2.** Medication Adherence Among Children (Pre- and Post-Intervention).

Child	Pre-Adherence (%)	Post-Adherence (%)
Child 1	40	80
Child 2	50	85
Child 3	60	90

The main findings of this research show that family empowerment programs significantly impact children's adherence to TB treatment. Prior to the intervention, many families lacked sufficient knowledge about TB and the importance of consistent medication adherence [43], [41]. The training program increased their understanding, particularly concerning the side effects of the medication and how to manage them [45]. As a result, families became more confident in supporting their children throughout the treatment process.

Additionally, the study revealed that children whose families were involved in the treatment process markedly improved their adherence to the prescribed regimen. This was evidenced by a noticeable increase in the percentage of children adhering to their medication schedule after implementing the program [46]. The families' ability to manage and mitigate side effects was also improved, leading to better cooperation from the children in taking their medicine regularly.

This study's first objective was to increase families' knowledge regarding tuberculosis (TB) and the importance of adhering to the medication regimen. The results showed a significant improvement in the families' understanding of TB after the training [46], [47]. Before the intervention, most families had limited knowledge about the disease and the necessity of completing the full treatment cycle. However, after the training, families reported a better understanding of TB transmission, treatment protocols, and non-adherence risks [51], [52].

The second objective was to improve medication adherence in children undergoing TB treatment. The results confirmed that the intervention led to a substantial increase in adherence [51], [52], [53]. Children whose families were trained and equipped with proper medication management strategies showed improved adherence, with adherence rates rising from an average of 50% to 85%. This directly resulted from the families' enhanced involvement in the treatment process, using medication reminders and regular monitoring techniques.

Another significant outcome of the study was the improvement in families' skills in managing the side effects of TB medications. Prior to the training, many families were unaware of how to manage common side effects such as nausea, vomiting, or dizziness, which often discouraged children from continuing the treatment. After the training, families were better equipped with practical strategies to mitigate these side effects, which helped increase the children's willingness to adhere to their treatment regimens. These findings collectively demonstrate that family empowerment plays a crucial role in improving both knowledge and adherence to TB treatment, ultimately contributing to better health outcomes for children with TB.

### 3.2. Discussion

The results of this research strongly support the hypothesis that family empowerment can improve medication adherence in children with tuberculosis (TB). The findings demonstrated that after the family training program, there was a significant increase in families' knowledge about TB and children's adherence to their treatment regimens [54], [55], [56]. The improved understanding of the disease and treatment process and the practical strategies for managing medication side effects were critical in helping families better support their children through the treatment process [45], [57]. This supports the initial hypothesis that empowering families through education and support can lead to better health outcomes for children with TB.

The results align with theories that emphasize the role of family in health behavior. According to the Health Belief Model (HBM), individuals' health behaviors are influenced by their perceptions of health risks and the perceived benefits of taking action [22], [58]. In this study, the families' enhanced understanding of TB and its treatment process increased their perception of the importance of adhering to the treatment regimen, thereby improving their involvement and commitment to managing their children's health [59]. This is consistent with findings from recent research, which suggests that health education and empowerment can lead to improved treatment outcomes for children. Furthermore, the Social Cognitive Theory supports the idea that as agents of change, families can help children overcome barriers to treatment adherence through positive reinforcement and learning through experience [60].

An unexpected finding from the study was that children who received regular emotional support from their families showed an even greater increase in treatment adherence than initially anticipated. This suggests that the emotional component of the family's support system may play a more crucial role than originally thought in the success of the treatment [61]. Based on these findings, a new theory could be developed that emphasizes the combined impact



of emotional support and practical medication management strategies as key components in achieving higher adherence rates in pediatric TB treatment [65]. This could be called the Holistic Family Empowerment Model for TB treatment adherence, which integrates practical and emotional support from families.

The findings of this study are consistent with previous research on family involvement in pediatric TB treatment adherence. Studies have shown that family education can enhance medication adherence by providing caregivers with the necessary knowledge and skills to manage treatment effectively [64], [65]. Additionally, this research supports the findings, emphasizing the importance of family empowerment in improving health outcomes in children with TB [66]. This study and previous research highlight that the more engaged the family is, the more likely the child will adhere to the treatment plan, suggesting a strong correlation between family involvement and treatment success [66].

The results of this study are consistent with prior research, like the studies by Kurniawan et al. This research underscores the critical role of family support in improving adherence to TB treatment. Both the educational component of the intervention and the emotional support provided by the families were found to enhance the treatment adherence of children significantly, confirming the findings of previous studies that family empowerment leads to better health outcomes [70]. No contradictions were found between this study and earlier research, reinforcing the value of family involvement in pediatric TB treatment.

The results of this study have significant implications for the development of health behavior theories, particularly those concerning the role of family in health management. The findings support the integration of family empowerment into existing health models, such as the Health Belief Model and Social Cognitive Theory, to create a more comprehensive framework that includes emotional and practical support [71], [72], [73]. These findings also suggest the need for a broader conceptual framework that incorporates emotional well-being as a determinant of health behavior, which could be beneficial in developing interventions for chronic illnesses and other long-term health conditions.

The practical implications of this study suggest that healthcare providers should focus on involving families in the treatment process, particularly in managing pediatric TB. Policy changes that prioritize family-centered interventions, including education on disease management and emotional support strategies, could improve treatment adherence and reduce TB transmission rates [74], [75]. Additionally, healthcare systems may consider implementing regular family education programs as part of routine pediatric care for chronic and infectious diseases [76]. This could enhance the role of families in the healthcare process, improving both individual and community health outcomes.

One of the methodological limitations of this study is that data collection was primarily based on self-reported surveys from families, which may introduce bias. Families may have reported higher levels of adherence and knowledge than were observed due to social desirability or memory recall issues [74]. Additionally, the sample size was relatively small and confined to one geographic location, which may limit the generalizability of the results [75]. Future studies could address these limitations by incorporating objective measures of medication adherence, such as pill counts or electronic monitoring, and expanding the sample to include multiple regions for a more representative view of the impact of family empowerment programs.

#### 4. CONCLUSION

In conclusion, this study has demonstrated the significant role of family empowerment in improving medication adherence among children with Tuberculosis (TB). The findings highlight the positive impact of family education and support, both practical and emotional, in ensuring that children complete their treatment regimen. This research emphasizes the importance of integrating family-centered interventions into healthcare practices to enhance the overall effectiveness of TB treatment. For future research, it is recommended to expand the scope of the study to include long-term follow-up to assess the sustainability of improvements in medication adherence and health outcomes. Additionally, future studies could explore the effectiveness of different types of family interventions, such as peer support groups or community-based programs, to determine which methods provide the greatest benefits. Another suggestion is to investigate the role of technology, such as mobile apps or digital reminders, in supporting families during the treatment process. Exploring the application of family empowerment programs in other chronic diseases also offers valuable insights into how such interventions can be adapted and implemented across various healthcare contexts.

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