Original Article

Interactive Counseling Skills Method to Improve Parental Compliance and Self-Efficacy in Child Tuberculosis Prevention Therapy: A Mixed Methods Study

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ABSTRACT

Background: Tuberculosis (TB) is transmitted through saliva droplets containing Mycobacterium tuberculosis. TB Preventive Therapy (TPT) is provided to individuals infected with M. tuberculosis who do not show symptoms of active disease, particularly as part of a child contact investigation. The success of TPT largely depends on parental self-efficacy and adherence in supporting their children throughout therapy. The Interactive Counseling Skills (ICS) strategy is proposed to strengthen these factors. The aim is to examine the effect of ICS on parents' self-efficacy and adherence in accompanying their children during TPT..

Methods: This study used a mixed-methods approach with quantitative and qualitative data, applying a sequential explanatory design. Sampling was conducted using a quasi-experimental method with a total of 60 participants divided into intervention and control groups. Instruments used included questionnaires and interview guides, with validity tested through Cronbach's Alpha and triangulation. Data analysis was conducted using the Paired T-Test/Wilcoxon test and thematic analysis.

Results: The findings showed a significant increase in parental self-efficacy ($p = 0.001$) and treatment adherence ($p = 0.002$) in the intervention group compared to the control group. Qualitative findings supported the quantitative results, with parents in the intervention group stating that the interactive counseling sessions provided them with a better understanding of TB, increased their confidence in supporting the therapy process, and helped them understand the importance of regular TPT administration after attending the ICS sessions.

Conclusion: This study demonstrates strong convergence, where the parents' experiential narratives reinforce significant statistical data. The intervention not only increased self-efficacy and adherence rates but also fostered changes in attitude, understanding, and confidence. It is necessary to develop ICS training modules for healthcare workers so that this intervention can be implemented sustainably and consistently within family-based health services

Keywords: Tuberculosis; Counseling; Self-Efficacy; Patient Adherence; Children.

Implications for Practice:

- Interactive Counseling Skills should be integrated into routine clinical care to strengthen parental adherence during children's TB preventive therapy.
- Health policymakers should incorporate ICS-based psychosocial support into national pediatric TB programs to enhance caregiver self-efficacy and treatment continuity.

Implications for Practice:

- Midwifery and health professional education should include ICS training to equip providers—particularly in resource-limited LMIC settings—with effective communication strategies that support sustainable TB prevention efforts.

Introduction

Tuberculosis (TB) remains a major global health challenge. According to the World Health Organization (WHO) Global Tuberculosis Report 2023, an estimated 10.6 million new TB cases occurred in 2022, with approximately 1.3 million deaths reported among the non-HIV population (Jatim, 2023). In Guinea-Bissau, an observational study reported that 76% of the children completed 6 months of IPT. It was also shown in Guinea-Bissau that children living with TB cases had increased all-cause mortality (Lemvik et al., 2025). Children account for about 12% of total TB cases, many of whom are either undiagnosed or fail to complete treatment. This represents a significant burden, particularly in developing countries such as Indonesia, which ranks among the top eight countries with the highest TB burden worldwide. One person with active TB can potentially transmit the infection to 10–15 individuals per year (Fairil & Haskas, 2024). The city of Surabaya is among the urban areas with a high TB burden. In 2024, the number of pediatric TB cases detected (1,327 cases) represented only 42.6% of the target (3,113 cases), indicating a substantial gap in pediatric TB case detection (T. Pakasi et al., 2023). To address this, Tuberculosis Preventive Therapy (TPT) has been promoted as an essential strategy to prevent progression to active TB among children who have had close contact with adult TB patients (Gumara et al., 2025). However, the success of this program is highly dependent on parental adherence to administering medication consistently, as well as their self-efficacy, the belief in their ability to accompany and support the child throughout the treatment process. Previous studies have shown that adherence to TPT among children remains suboptimal (Heri et al., 2020). A commonly overlooked factor is the low self-efficacy among parents, which negatively impacts their role in ensuring treatment completion (Sutarto et al., 2019). Therefore, an effective counseling approach is needed, one that not only delivers information but also enhances motivation, understanding, and confidence among parents in fulfilling their role as treatment supporters (T. T. Pakasi et al., 2025). Parental self-efficacy plays an important role in parental therapeutic self-efficacy in parent-mediated interventions. Coaches should specifically ask about the child's skills, parents' interaction style, environmental challenges, and the child's response as they support parents (Russell & Ingersoll, 2021).

Preliminary studies indicate that many parents face significant challenges in supporting their children during tuberculosis preventive therapy (TPT). Several obstacles reported by parents include a lack of understanding about the importance of long-term treatment, fear of potential side effects, and uncertainty about how to provide appropriate support throughout the therapy process. These issues contribute to low levels of parental adherence in accompanying their children through TB preventive treatment (E. Sari et al., 2023). Parental adherence is a critical factor, as the effectiveness of TPT largely depends on consistent supervision and support. Without adequate parental involvement, the therapy is unlikely to achieve its goal of preventing the onset of active TB in children. Parents with high self-efficacy tend to feel more confident and

motivated to take an active role in managing their child's treatment (Nuroctavia et al., 2021).

For children, TB preventive therapy is likely caregiver-dependent, particularly focusing on the perceptions and knowledge of parents or caregivers (Zeladita-Huaman et al., 2021). One emerging approach in health education is Interactive Counseling Skills (ICS), a participatory, experience-based, and two-way communication counseling method. Unlike traditional methods such as one-way lectures or the distribution of leaflets, ICS actively engages parents, allowing them not only to receive information but also to build understanding and practical skills. Despite its promising nature, there is still limited research on the effectiveness of ICS in the context of pediatric Tuberculosis Preventive Therapy (TPT), particularly regarding its impact on parental self-efficacy and treatment adherence (Taqwim et al., 2023). Furthermore, many previous studies have employed purely quantitative approaches, which often fail to explore subjective experiences and contextual factors that influence parental adherence. This study aims to assess the impact of Interactive Counseling Skills (ICS) in enhancing parental adherence and self-efficacy in accompanying their children through TPT.

This research is grounded in Social Cognitive Theory, developed by Albert Bandura, which posits that self-efficacy is a key determinant in decision-making and behavioral change. According to Bandura, individuals with high self-efficacy are more likely to overcome obstacles, take initiative, and persist through challenges. In this context, parents who feel confident in their ability to support their child's therapy are more likely to be consistent and compliant in administering TPT. The ICS intervention is designed to foster this belief through observational learning, direct experience, verbal persuasion, and emotional reinforcement. Currently, most educational and counseling strategies in TPT programs remain passive and one-directional, such as general health talks or the distribution of printed materials. Previous studies have not shown optimal results, particularly in promoting long-term behavioral change, and few have specifically measured parental self-efficacy as an indicator of intervention success. Moreover, traditional counseling approaches have not been proven effective in promoting sustained adherence (N. M. Sari et al., 2021). Some studies have used counseling as a tool to educate parents, but there are still many challenges in achieving optimal adherence, especially in pediatric TB prevention therapy. Approaches often focus solely on providing information without involving parents in the decision-making process, or only offer limited support without addressing the internal barriers parents face in caring for children with TB (Ardiana et al., 2021). Therefore, there is a need for a more participatory and contextually relevant approach, such as ICS, which has not yet been widely evaluated empirically in the context of pediatric TPT.

To address this gap, the present study adopts a mixed-methods design, which combines quantitative data to measure the effectiveness of the ICS intervention and qualitative data to explore the subjective experiences of parents. This integrated approach allows for a more holistic understanding of the intervention's impact, capturing not only numerical outcomes but also psychosocial and contextual factors that influence its success. Quantitative data were used to assess improvements in self-efficacy and adherence, while qualitative data provided insights into the behavioral changes and perceptions of parents during the therapy support process (Nasaruddin et al., 2024).

Based on the background presented, this study seeks to explore the effectiveness

of the Interactive Counseling Skills (ICS) intervention in enhancing parental self-efficacy and adherence during their children's tuberculosis preventive therapy (TPT). Specifically, it examines whether ICS can significantly improve parents' confidence in supporting their child throughout the therapy and increase their compliance in administering the medication as prescribed. Additionally, the study aims to understand the experiences of parents who participate in the ICS intervention, shedding light on how this approach influences their role as treatment companions. The hypotheses guiding this research propose that there will be a significant increase in parental self-efficacy following the ICS intervention and that parents receiving ICS will demonstrate higher adherence to TPT compared to those in the control group. The urgency of this investigation stems from the critical role of parents in ensuring the success of pediatric TB preventive therapy. Active parental involvement is essential to guarantee that treatment is administered consistently and correctly, ultimately reducing the risk of TB development in children. Therefore, identifying and validating effective counseling strategies like ICS is crucial for strengthening TB prevention efforts.

Methods

Study Design

This study employed a sequential explanatory mixed-methods design, in which quantitative data were collected first to measure levels of parental adherence and self-efficacy, followed by a qualitative phase aimed at further explaining and deepening the quantitative findings. Creswell and Plano Clark guided the research framework in designing and integrating both quantitative and qualitative components, and adhered to the GRAMMS reporting guidelines to ensure the quality and transparency of mixed-methods reporting. This approach is grounded in the pragmatic paradigm, which allows for the flexible use of multiple methods to gain a comprehensive understanding of the effectiveness of Interactive Counseling Skills (ICS) in improving parental adherence and self-efficacy within the context of pediatric tuberculosis preventive therapy in Indonesia (Sugiyono, 2020).

Participants

This study involved 60 parents of children undergoing tuberculosis preventive therapy (TPT), selected through simple random sampling and randomly assigned to either the intervention group (n = 30) or the control group (n = 30). For the qualitative strand, purposive sampling was employed to recruit participants from both groups who had completed the intervention. Inclusion criteria for the quantitative strand were: being a parent or primary caregiver of a child undergoing TPT, aged ≥18 years, able to read Indonesian, and willing to complete the full intervention. Exclusion criteria included cognitive or psychiatric disorders and failure to complete the intervention. For the qualitative strand, participants were eligible if they had completed the entire intervention and agreed to be interviewed and recorded, while those unavailable or unwilling to participate were excluded. Sample size for the quantitative phase was determined using G*Power, assuming an independent t-test with an effect size of 0.65, $\alpha = 0.05$, and power = 0.80, resulting in a minimum requirement of 27 participants per group; to accommodate potential dropout, 30 participants were recruited per group. In the qualitative phase, data saturation was achieved after the eighth interview, indicated by the absence of new emerging themes, and validation was conducted through team discussions to ensure data credibility and trustworthiness.

Instruments

This study employed both qualitative and quantitative instruments to examine parental self-efficacy, knowledge, attitudes, and practices in supporting children undergoing Tuberculosis Preventive Therapy (TPT). Qualitative data were collected using a semi-structured interview guide to explore parents' experiences, perceptions, and challenges in supervising TPT, as well as their communication with health workers. Quantitative instruments included questionnaires and checklists assessing parental self-efficacy, knowledge, attitudes, and practices. Based on the study results, parental self-efficacy was categorized as high or low, knowledge as good or poor, attitude as positive or negative, and practice as good or poor, reflecting the observed levels in the participants without specifying numerical scoring or cut-off values.

Data Collection

Data collection was conducted in two phases:

Quantitative Phase (July–August 2025):

Data were collected using pre- and post-intervention questionnaires to assess parental adherence and self-efficacy in supporting their child's tuberculosis preventive therapy (TPT). Participants (N = 60) were randomly assigned to either the intervention group (n = 30) or the control group (n = 30). The questionnaires used were adapted and validated versions of the Morisky Medication Adherence Scale (MMAS-8) and the General Self-Efficacy Scale (GSES).

Qualitative Phase (September 2025):

In-depth interviews were purposively conducted with eight participants from both groups, selected based on variations in their quantitative scores. The interview guide was developed by the research team and is included as a supplementary document.

The point of integration occurred during the selection of qualitative participants based on quantitative results, and during the interpretation stage to enrich the findings. Interviews were conducted by researchers trained in health and counseling. To minimize bias and enhance the validity of qualitative data, several strategies were applied, including researcher reflexivity, field notes, and member checking.

Data Analysis

This study employed a mixed-methods analysis strategy guided by the GRAMMS framework to ensure methodological rigor and transparency. Quantitative data were analyzed using SPSS v26, beginning with a normality test using the Kolmogorov–Smirnov method, followed by descriptive statistics, independent t-tests, and paired t-tests to evaluate the effects of the intervention, with a significance level set at $p < 0.05$. Qualitative data were processed thematically using Braun and Clarke's six-step approach, in which two researchers independently coded the transcripts, and coding reliability was verified using Cohen's Kappa ($k > 0.75$). The qualitative analysis was supported by NVivo 12. Integration of data was conducted through two strategies: connecting, in which quantitative results informed the selection of qualitative interview participants; and merging, where both datasets were interpreted together through joint displays to compare and link findings. This comprehensive analytic approach enabled a deeper understanding of how Interactive Counseling Skills (ICS) influence parental adherence and self-efficacy in pediatric TB prevention.

To minimize bias, the researchers practiced reflexivity and maintained a full audit trail throughout the analysis process. Methodological and investigator triangulation were applied to strengthen validity. Qualitative data credibility was

ensured through member checking, peer debriefing, and thorough documentation to support credibility, dependability, transferability, and confirmability.

Quantitative instruments used in this study were validated and reliable, with Cronbach's alpha > 0.7; for any newly developed instruments, validity and reliability testing were conducted prior to use.

Ethical Considerations

Written informed consent was obtained from all participants prior to quantitative data collection. For qualitative interviews, written and/or verbal consent was obtained based on participant agreement and context. All data were anonymized, securely stored with restricted access, and protected by a password to ensure participant confidentiality and privacy. This study received ethical approval from the Institutional Ethics Committee of STIKES William Booth, with approval number: 02-Dosen/STIKES-WB/ETIK/VII/2025.

Results

Table 1. Demographic Characteristics of Respondents (n=60)

Characteristics	Intervention Group		Control Group		*p value*
	Frequency	%	Frequency	%	
Age					
20-30 years	11	36,6	9	30	0.690
31-40 years	8	26,6	6	20	
41-50 years	8	26,6	7	23,3	
50-60 years	2	6,6	5	16,6	
Gender					
Male	1	3,3	3	10	0,270
Female	12	40	8	26,6	
Education			22	73,3	
No Schooling	18	60	22	73,3	0,940
Elementary School	2	6,6	3	10	
Junior High School	5	16,6	3	10	
Senior High School	9	30	8	26,6	
Higher Education	12	40	13	43,3	
Occupation					
Unemployed	2	6.6	3	10	0.880
Private Employee	18	60	16	53,3	
Entrepreneur	5	16,6	6	20	
Civil Servant	5	16,6	4	13,3	

*Homogeneity Test (Chi-Square Test)**

Based on the analysis of respondent characteristics in the intervention and control groups, it was found that both groups had a relatively balanced distribution. In terms of age, the majority of respondents were in the productive age range, namely 20–50 years. The intervention group was dominated by respondents aged 20–30 years (36.6%), while in the control group, only 30%. The homogeneity test showed a p-value of 0.690, indicating no significant difference between the two groups based on age distribution. Gender characteristics also showed a distribution that was not very different. The intervention group consisted of 60% women and 40% men, while in the control group, women dominated at 73.3% and men at 26.6%. The results of the statistical test showed a p-value of 0.270,

which means that both groups were homogeneous by gender. In terms of education level, the majority of respondents in both groups had secondary education, namely high school graduates (40% in the intervention group, and 43.3% in the control group), followed by junior high school graduates. The homogeneity test yielded a p-value of 0.940, indicating no significant difference in education level between groups. Based on occupation, unemployed respondents dominated both groups, comprising 60% in the intervention group and 53.3% in the control group. The proportion of respondents working as private employees, self-employed, and civil servants was also relatively similar. The p-value of 0.880 in the homogeneity test confirmed that there were no significant differences between groups in terms of status and occupation. Overall, the homogeneity test results indicated that the baseline characteristics of respondents in the intervention and control groups were homogeneous (all p-values > 0.05). This indicates that both groups were in equivalent conditions before the intervention, allowing for a more objective evaluation of the intervention results without the influence of differences in baseline demographic characteristics (**Table 1**).

Quantitative Results

Table 2. Distribution of Parental Self-Efficacy Scores Before and After Receiving Interactive Counseling Skills in the Intervention and Control Groups (for Children Undergoing Tuberculosis Preventive Therapy – TPT)

Self Efficacy	**Intervention**		**Control**	
Pre Test	Frequency	%	Frequency	%
Very Weak	11	36,6	13	43,3
Weak	9	30	12	40
Moderately Strong	6	20	3	10
Strong	2	6,6	2	6,6
Very Strong	2	6,6	0	0
Total	30	100	30	100
Post Test				
Very Weak	1	3,3	8	26,6
Weak	3	10	12	40
Moderately Strong	7	23,3	5	16,6
Strong	13	43,3	1	3,3
Very Strong	6	20	1	3,3
Total	30	100	30	100
Uji Wilcoxon	p-value = < 0.001	Z = -4.23	p-value = 0.107	Z = -1.61
Uji Mann-Whitney	*Pre Test*	0.214	Test Statistic (U)= 398.5	Uji Mann-Whitney
	Pos Test	0.001	Test Statistic (U)= 182.0	

The analysis results showed that before the intervention, the level of parental self-efficacy in both groups was dominated by the very weak and weak categories, with no significant difference (p = 0.214). After being given interactive counseling skills, there was a significant increase in the intervention group, indicated by an increase in the strong and very strong categories (p < 0.001; Z = -4.23). In contrast, there was no significant change in the control group (p = 0.107; Z = -1.61). The results of the Mann-

Whitney post-test also showed a significant difference between the two groups (p = 0.001), indicating that the intervention was effective in increasing parental self-efficacy. (**TabLe 2**).

Table 3. Distribution of Data Analysis on TPT Treatment Compliance in Children with Pulmonary TB After Being Given Interactive Counseling Skills in the Intervention and Control Groups

Obedience Category	Intervention		Control	
	Frequency	Percentage.	Frequency	Percentage.
Medication Discipline				
Disciplined (>3 times/week for 3 months)	28	93,3	18	60
Undisciplined (<3 times/week for 3 months)	2	6,6	13	43,3
Treatment Adherence				
Adherent (TPT once/week for full 12 weeks)	28	93,3	18	60
Non-Adherent (TPT <12 weeks)	2	6,6	13	43,3
Uji Wilcoxon	*p-value = 0.001*	*Z = -4.23*	*p-value = 0.107*	*Z = -1.61*
Uji Mann-Whitney	*Pre Test*	0.115	Test Statistic (U) = 598.6	Uji Mann-Whitney
	Pos Test	0.002	Test Statistic (U)= 192.0	

After being given interactive counseling skills, the level of parental compliance in accompanying their children to undergo TPT treatment increased significantly in the intervention group. A total of 93.3% of respondents in this group showed high discipline and compliance in administering medication, compared to only 60% in the control group. The Wilcoxon test showed a significant change in the intervention group (p = 0.001; Z = -4.23), but not in the control group (p = 0.107). In addition, the results of the Mann-Whitney post-test showed a significant difference between the intervention and control groups (p = 0.002), indicating that the intervention was effective in improving adherence to TPT treatment in children (**Table 3**).

Qualitative Results

Interviews were conducted with eight parents of participants who had received the ICS intervention to determine the extent to which ICS was beneficial in improving adherence to TPT treatment in children**.**

Theme 1: Parents' Understanding and Experience of ICS in the Context of TB Preventive Therapy (TPT)

Sub-theme 1.1: Limited Initial Awareness but Rapid Understanding

Several parents were initially unfamiliar with the term Interactive Counseling Skills (ICS). However, they were able to grasp its meaning once it was explained in simple, relatable terms.

> *"Honestly, I first heard the term ICS from the health worker. But after the explanation, I understood it was a way to communicate better with my child."*

This indicates that ICS is a new concept to many caregivers, and future

implementations must include accessible educational strategies to ensure comprehension across literacy levels.

Sub-theme 1.2: Positive Experience with Participatory Counseling

Parents reported that ICS involved them more directly in the counseling process compared to previous methods that focused primarily on the child.

> *"During the session, I was invited to talk and engage with my child. Usually, only the child attends, but now I was part of the discussion too."*

This highlights the participatory nature of ICS, which fosters collaborative understanding between parent and child about the purpose and importance of TPT.

Sub-theme 1.3: Counseling Perceived as Less Formal and More Child-Friendly

ICS sessions were described as more comfortable and emotionally supportive compared to conventional counseling.

> *"The counseling method felt more enjoyable and less formal. My child wasn't as afraid when we talked about taking medicine."*

This suggests that ICS created a psychologically safer environment, which is crucial in the context of long-term preventive therapy for children.

Theme 2: Parents' Perceived Effectiveness of ICS in Supporting TPT Adherence

Sub-theme 2.1: Improved Understanding and Motivation in Children

Parents observed that their children were more cooperative after participating in ICS sessions, largely due to the interactive and non-intimidating communication approach.

> *"After it was explained in a more fun way, my child understood why he had to take the medicine every day. Before, it was always a struggle."*

This shows that ICS helps bridge the gap between instruction and behavior change by making the information meaningful to children.

Sub-theme 2.2: Strengthened Emotional Support for Parents

Parents reported gaining emotional confidence and practical strategies for supporting their child throughout the therapy.

> *"I also feel calmer now. I've learned how to explain things to my child without making him cry or scared."*

This highlights that ICS not only improves child adherence but also empowers caregivers by reducing anxiety and improving communication skills.

Sub-theme 2.3: Emotional Barriers Still Present in Some Situations

Despite positive outcomes, certain emotional or physical states in the child (e.g., fatigue, mood swings) still posed challenges.

> *"When my child is tired or not feeling well, it's still hard to persuade him to take the medicine, even when I explain it gently."*

This suggests that while ICS is helpful, it is not a standalone solution and may need to

be integrated with other behavioral support techniques.

Sub-theme 2.4: Concerns About Long-Term Consistency

Some parents expressed skepticism about the lasting effect of ICS when facing recurring resistance from the child.

> *"If my child is not in the mood, it's still difficult. No matter how often I explain, he still refuses*."

This indicates the need for reinforcing sessions or additional psychosocial support to maintain consistent adherence over time.

Sub-theme 2.5: Hope for Continued and Structured Support

Parents expressed a strong preference for ICS to be implemented regularly rather than as a one-time intervention.

> *"If possible, this kind of support shouldn't just happen once. Kids need constant reminders and encouragement so they don't get bored or forget."*

This demonstrates that ongoing, structured support is critical for sustaining both parental engagement and child adherence during the 12-week TPT regimen.

Integration of Findings

Quantitative analysis revealed that the Interactive Counseling Skills (ICS) intervention significantly improved parental self-efficacy and adherence in supporting children undergoing tuberculosis preventive treatment (TPT). These findings were reinforced by qualitative data, which highlighted positive parental perceptions of the counseling sessions. Most participants reported that ICS sessions made them feel more confident, informed, and prepared to fulfill their roles in supporting their child's treatment process.

The qualitative findings also illustrated that ICS created a more engaging, empathetic, and child-friendly counseling environment. Parents described improved communication with their children and reduced emotional stress during the treatment journey, even though occasional challenges remained, particularly when children were unwell or uncooperative.

Overall, there is strong convergence between quantitative and qualitative data, offering a complementary and comprehensive understanding of the intervention's effectiveness. The following joint display table illustrates how both data strands align (**Table 4**):

Table 4. Integration of Quantitative and Qualitative Findings (Joint Display)

Aspect	Quantitative Findings	Qualitative Findings	Integrative Interpretation / Convergence
Respondent Characteristics	Homogeneous; no significant differences in age, gender, education, or occupation ($p > 0.05$).	Parents came from varied backgrounds but had consistent experiences with therapy.	Both groups were demographically equal prior to intervention, so outcomes are attributable to ICS, not bias.
Parental Self-Efficacy	Significant improvement after ICS intervention ($p < 0.001$), an increase in "strong" and "very strong" categories.	Parents reported feeling more confident and able to communicate calmly and effectively with their children.	ICS enhances communication skills and emotional support, increasing parents' confidence and mastery.

Aspect	Quantitative Findings	Qualitative Findings	Integrative Interpretation / Convergence
Treatment Adherence	Adherence was significantly higher in the intervention group (93.3% vs 60%, p = 0.002).	Parents noted better child cooperation and understanding, though emotional states still posed challenges.	ICS fosters empathetic, engaging communication that motivates children, though emotional barriers remain.
Barriers / Challenges	Not all participants maintained adherence/self-efficacy post-intervention.	Parents reported difficulties when children were tired or in a bad mood.	Self-efficacy and adherence are dynamic; a child's emotional state affects outcomes. Additional strategies needed.
Expectations and Suggestions	Not captured quantitatively.	Parents expressed a desire for continuous ICS support throughout treatment.	ICS should be implemented as a sustained program to support long-term motivation and address psychosocial barriers.

Discussion

Parental Self-Efficacy

This study found that the interactive counseling skills (ICS) intervention significantly improved parents' self-efficacy in assisting their children undergoing tuberculosis preventive therapy (TPT). Prior to the intervention, both the intervention and control groups had low self-efficacy levels, with most participants categorized as "very low" or "low." No significant difference was found in the pre-test ($p = 0.214$), indicating baseline homogeneity and strengthening the internal validity of the intervention results.

After the intervention, a significant increase in self-efficacy was observed in the intervention group, with most parents falling into the "high" and "very high" categories ($p < 0.001$; $Z = -4.23$). In contrast, no significant change was seen in the control group ($p = 0.107$; $Z = -1.61$). The post-test Mann-Whitney test confirmed a significant difference between the groups ($p = 0.001$), indicating the effectiveness of ICS in enhancing parental self-efficacy.

These findings align with Bandura's self-efficacy theory, which identifies four key sources of self-efficacy: mastery experiences, vicarious experiences, verbal persuasion, and emotional/physiological states. The interactive nature of ICS allows parents to gain direct experience, enhances their understanding of TPT, provides positive modeling from health educators, and supports emotional well-being through empathetic communication (Bandura, 2023).

Qualitative data supported these outcomes. Parents reported feeling calmer and more capable of explaining treatment to their children without causing fear or resistance. One parent stated:

> *"I also feel calmer. I know how to explain things to my child without making them cry or scared."*

This result is consistent with previous research showing that educational and psychosocial interventions improve self-efficacy in TB patients and their families. For example, (Sukartini et al., 2020) demonstrated significant self-efficacy improvement through psychoeducation among families of pulmonary TB patients ($p = 0.000$). Similarly, Sari found increased self-efficacy among adult TB patients in Mataram after receiving psychoeducational therapy. A study in Blitar also showed an average self-efficacy score increase from 24 to 32.63 after a personalized counseling program (N. M. Sari et al., 2021).

Family involvement has also been shown to improve treatment outcomes. Informational support from the family plays a crucial role; a study in Jakarta found that low informational support was significantly associated with low self-efficacy in TB patients (p = 0.002). From a practical standpoint, ICS interventions should be integrated into TPT support programs, particularly for pediatric cases. Counseling serves not only as an information delivery tool but also as a means of psychological empowerment for parents. Improved self-efficacy enhances parental involvement, which is essential for long-term treatment success. As one parent shared:

> *"After it was explained in a fun way, my child better understood why they had to take the medicine every day."*

Regarding age characteristics, most participants were within the productive age range (20–50 years), a period marked by optimal physical, cognitive, and emotional function for caregiving. In the intervention group, the majority were aged 20–30 years. Individuals in this age group are more likely to process information effectively, make health-related decisions, and adopt positive health behaviors. According to Notoadmojo in Masyfahani, age influences health behavior through maturity in thinking and decision-making. Therefore, parents in this productive age group were more responsive to the ICS intervention, contributing to improved self-efficacy in supporting their children during TPT (Masyfahani et al., 2020).

Compliance with Tuberculosis Preventive Therapy (TPT) in Children

This study found that the interactive counseling skills (ICS) intervention significantly improved parental compliance with children's Tuberculosis Preventive Therapy (TPT). After the intervention, 93.3% of parents in the intervention group adhered to administering TPT medication, compared to only 60% in the control group without intervention. Wilcoxon test results showed a significant change in the intervention group (p = 0.001; Z = -4.23), while no significant change was observed in the control group (p = 0.107). Additionally, post-intervention Mann-Whitney test confirmed a significant difference between groups (p = 0.002), supporting the intervention's effectiveness.

Compliance is critical because successful therapy depends on regular and complete medication intake, especially for children fully reliant on their caregivers. Non-compliance risks treatment failure, drug resistance, and undermines TB elimination goals. ICS is effective as it is not only informative but also educational and persuasive. The two-way communication approach allows parents to ask questions, discuss, and understand the consequences of non-compliance. According to Green & Kreuter's health behavior theory, behavior change depends on predisposing factors (knowledge, attitudes, beliefs), enabling factors (support, access), and reinforcing factors (support from health workers, family, environment). ICS indirectly addresses all these factors (Terry, 2021). Parents reported a better understanding of their role in their child's TPT after ICS. Some, initially unfamiliar with ICS, acknowledged it as a more comfortable and effective communication method:

> *"Honestly, I first heard about ICS from a community health worker. After it was explained, I understood it's a way to communicate more comfortably with my child."*

These findings align with previous studies. Sukartini et al showed that counseling-based health education significantly improved TB treatment adherence in families (Sukartini et al.,

2020). Gumara found that increasing similarity between parents was more effective than a one-way approach in improving parental adherence to children's TB treatment (Gumara et al., 2025). The WHO emphasizes family involvement, adequate education, and supportive communication from health workers as key factors in improving TB treatment adherence in children (Viney, 2023). This is also supported by the parents' statement that :

> *" Parents also noted, "During counseling sessions, I was invited to speak directly with my child. Usually, only the child is invited, but now I am also included."*

This highlights ICS's role in shifting parents from passive listeners to active participants, fostering shared responsibility between child and parent in treatment adherence.

Regarding education, most respondents in both groups had secondary education (high school), with 40% in the intervention group and 43.3% in the control group. Homogeneity tests (p = 0.940) confirmed no significant difference in educational levels between groups. Education is a key determinant of health behavior, as higher education generally enhances cognitive capacity to receive, understand, and apply health information. This supports Notoatmodjo's assertion that education influences how individuals process health information and make decisions for themselves and their families (Aji et al., 2023).

With a relatively homogeneous and mostly middle-level education background, the positive response to ICS indicates the method's broad applicability across different education levels, provided communication strategies are appropriate (Hakim & Putri, 2015). This study contributes to community nursing and health promotion, particularly in managing pediatric TPT. Findings confirm that ICS effectively improves parental self-efficacy and compliance, underscoring the importance of psychosocial support in health behavior change. Furthermore, the mixed-methods approach enriches scientific evidence by integrating quantitative and qualitative data, laying a foundation for family-based interventions in TB elimination programs.

Implications and limitations

The findings of this study indicate that interactive counseling methods can serve as an effective strategy to enhance parental self-efficacy and adherence in supporting their children through tuberculosis preventive therapy (TPT). In practical terms, this approach could be adopted within national TB programs as part of a more personalized and structured educational intervention. Providing counseling training for healthcare workers, community health cadres, or primary health center staff (Puskesmas) holds potential to strengthen the success of TPT at the community level.

However, this study is subject to several limitations, including a relatively small sample size, limited geographic scope, and a short observation period. To support broader policy-making and implementation, further research with larger populations and longer-term follow-up is needed to confirm the effectiveness and sustainability of this intervention across different regions and community groups**.**

Relevance to Practice

The findings of this study are highly relevant for nursing practice and primary healthcare services, especially in the prevention of tuberculosis (TB) in children. The results indicate that interactive counseling based on communication skills

can improve parental self-efficacy and adherence to Tuberculosis Preventive Therapy (TPT). Therefore, nurses, midwives, and other healthcare workers need to be trained to provide counseling that is not only informative but also empathetic, motivational, and empowering for families.

At the institutional level, such as in community health centers (Puskesmas) or TB clinics, this approach can be integrated into standard patient education procedures and TPT monitoring. Furthermore, policymakers at regional and national levels should consider developing counseling skills training modules as part of capacity-building programs for healthcare providers. This approach not only improves therapy outcomes but also strengthens the family's role as active partners in childhood TB control within the community

Conclusion

This study proves that the interactive counseling skills method effectively improves parental self-efficacy and adherence in supporting Tuberculosis Preventive Therapy (TPT) in children. This approach not only yields significant quantitative results but also enhances parents' understanding and motivation through deep interactions, as revealed by qualitative data. These findings emphasize the importance of integrating psychosocial aspects into child health programs and encourage the implementation of counseling training for healthcare workers to better support the successful management of TPT.

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CrediT Authorship Contributions Statement

Ethyca Sari: Conceptualization, Methodology, Supervision, Writing – Original Draft, Resources, Project Administration, Funding Acquisition

Martha Lowrani: Methodology, Validation, Writing – Review & Editing, Investigation

Devi Aprilia: Validation, Formal Analysis, Investigation, Data Curation, Writing – Review & Editing, Visualization

Conflicts of Interest

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Supplementary Materials

Supplementary File S1: Questionnaire contains the full questionnaire used for data collection.

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