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Increasing Parental Awareness about Tuberculosis Prevention in Children through Cadre Empowerment in Pacarkembang District, Surabaya

Indriatie, Aida Novitasari, and Nurhasanah

Health Polytechnic Minister of Health of Surabaya

Corresponding author: Indriatie (e-mail: ndrie.65bambang@gmail.com)

ABSTRACT Tuberculosis (TB) in children remains a significant public health problem in Surabaya, particularly in densely populated urban areas where behavioral and environmental factors contribute to sustained transmission. Limited parental awareness and suboptimal community participation continue to hinder effective TB prevention among school-aged children, despite existing control programs. Health cadres play a strategic role as community-based agents in strengthening parental knowledge and preventive practices; however, their effectiveness depends on adequate capacity building. This study aimed to evaluate the impact of cadre empowerment on increasing parental awareness of childhood tuberculosis prevention in the Pacarkembang District, Surabaya. A community-based empowerment program was conducted using a descriptive pre–post evaluation design involving 30 health cadres and 30 parents of elementary school aged children. The intervention comprised structured health education sessions, interactive discussions, counseling activities, and family assistance supported by audiovisual media and educational booklets. Levels of understanding among cadres and parents regarding childhood TB prevention were assessed before and after the intervention using categorical knowledge indicators. The results showed an improvement in cadres' understanding, with the proportion categorized as having "good" knowledge increasing from 90.0% prior to the intervention to 93.3% afterward. Similarly, parental awareness demonstrated a positive change, as the proportion of parents with "sufficient" understanding increased from 13.3% to 20.0% following cadre-led education and mentoring. Additionally, evaluation of the empowerment activities indicated high levels of participant satisfaction, relevance of educational materials, and perceived usefulness in supporting community counseling and family guidance. In conclusion, empowering health cadres through structured education and family-based assistance effectively enhances cadre capacity and parental awareness regarding childhood tuberculosis prevention. This approach represents a sustainable community-based strategy that can strengthen TB prevention efforts in children and should be continuously integrated into primary health care services and local tuberculosis control programs.

INDEX TERMS Health cadres, Parental awareness, Childhood tuberculosis prevention, Community empowerment, Health education.

I. INTRODUCTION

Tuberculosis (TB) remains a major global and national public health challenge, with children constituting a vulnerable population that is often underdiagnosed and insufficiently protected from transmission. In Indonesia, TB continues to rank among the leading infectious causes of morbidity and mortality, and urban areas with high population density show persistent transmission rates, including among school-aged children [1], [2]. Surabaya, as one of the largest metropolitan cities in East Java, records a high burden of TB cases, including pediatric TB, which reflects ongoing gaps in early detection, prevention, and community-based control efforts [3]. Children are particularly susceptible due to immature immune systems, close household contact with adult TB patients, and limited awareness among parents regarding early symptoms and preventive behaviors [4], [5].

Despite extensive national TB control programs, parental awareness and community participation in childhood TB prevention remain suboptimal. Previous studies have shown that family knowledge, attitudes, and health responsibilities significantly influence TB prevention behaviors and treatment adherence [6], [7]. However, health systems alone cannot effectively address TB transmission without active community engagement. Health cadres' community-based volunteers trained to support health promotion activities play a critical role in bridging formal health services and families, especially in

primary health care settings [8], [9]. Cadre involvement has been shown to improve case finding, reduce stigma, and enhance treatment supervision through culturally appropriate communication and sustained community presence [10].

Recent state-of-the-art approaches in TB prevention emphasize community empowerment, family-centered education, and the use of simple educational media such as booklets and audiovisual tools to improve health literacy [11], [12], [13]. Short-term, structured training programs for cadres have demonstrated effectiveness in increasing knowledge and confidence in delivering TB-related education [14], [15]. Furthermore, integrating cadre empowerment with household-level assistance has been associated with improved parental understanding and preventive practices for childhood TB [16]. These approaches align with Indonesia's national TB elimination strategy, which prioritizes community participation and early prevention at the family level [17].

However, a critical research gap persists in evaluating how cadre empowerment specifically influences parental awareness of childhood TB prevention within urban community settings. Most existing studies focus either on cadre knowledge improvement or parental education independently, with limited evidence examining their combined and sequential impact through structured mentoring and assistance programs [18], [19]. Additionally, there is a lack of localized evidence from densely populated urban districts such as Pacarkembang, Surabaya, where social, behavioral, and environmental risk factors coexist [20]. Addressing this gap is essential to inform scalable and context-sensitive TB prevention strategies.

Therefore, this study aimed to evaluate the effectiveness of empowering health cadres in increasing parental awareness of tuberculosis prevention among school-aged children in the Pacarkembang District, Surabaya. By assessing changes in both cadre capacity and parental understanding before and after the intervention, this study provides empirical evidence on the role of community-based empowerment in childhood TB prevention. The contributions of this study are threefold.

1. Provides evidence on the effectiveness of cadre empowerment as a sustainable strategy to enhance parental awareness of childhood TB prevention in urban communities.
2. Integrates cadre training with family-based assistance, offering a practical model that aligns with primary health care and national TB control programs.
3. Contributes localized data to support policy implementation related to community empowerment and TB elimination at the district level.

This article is structured as follows: Section I presents the introduction and research background; Section II describes the methods and implementation of the community empowerment program; Section III reports the results of the intervention; Section IV discusses the findings in relation to existing literature; and Section V concludes with implications and recommendations for future community-based TB prevention initiatives.

II. METHOD

This chapter outlines the methodological procedures used to implement and evaluate a community-based cadre empowerment program aimed at increasing parental awareness of childhood tuberculosis prevention. It describes the study design, setting, population and sampling, intervention framework, data collection methods, analytical approach, and ethical considerations to ensure clarity and replicability within a public health context.

A. STUDY DESIGN AND RASIONALE

This study employed a community-based prospective pre–post intervention design without randomization. The design was selected to evaluate changes in knowledge and awareness among health cadres and parents following a structured cadre empowerment program. A pre–post approach is appropriate for community empowerment and public health education studies where ethical and logistical considerations limit the use of randomized controlled designs [21], [22]. The prospective nature of the study allowed for direct observation of changes occurring after the intervention, while maintaining feasibility within a real-world primary health care context. This design aligns with current recommendations for evaluating community-based tuberculosis (TB) prevention initiatives, which emphasize practical implementation, stakeholder involvement, and outcome monitoring rather than experimental manipulation [23].

B. STUDY SETTING

The study was conducted in RW 08, Pacarkembang Urban Village, located within the service area of the Pacarkeling Community Health Center, Surabaya, Indonesia. This setting was purposively selected due to its dense population, ongoing TB prevention programs, and active involvement of community health cadres. The area is included in the Surabaya City TB elimination initiative, making it a relevant site for evaluating cadre empowerment strategies in urban communities [24]. All intervention activities, including training, family assistance, and community counseling, were conducted within community halls and participants' households to ensure contextual relevance.

C. STUDY POPULATION AND SAMPLING

The study population consisted of community health cadres (Kader Surabaya Hebat/KSH) and parents of elementary school–aged children residing in the study area. A total sampling technique was applied, involving all eligible cadres registered in RW 08 and parents who met the inclusion criteria. This approach is recommended for community intervention studies with small, defined populations to maximize participation and program impact [25]. The final sample included 30 cadres and 30 parents. Inclusion criteria for cadres were active cadre status, a minimum of one year of service, and willingness to participate throughout the study period. Inclusion criteria for parents included having children aged 6–12 years, residence in the study area, and consent to participate. Participants who were unavailable for post-intervention

assessment were excluded. The sample size met the minimum threshold commonly used in community-based educational interventions to observe meaningful descriptive changes [26].

D. INTERVENTION DESIGN AND IMPLEMENTATION FRAMEWORK

The intervention was designed based on a community empowerment and family-centered education framework, emphasizing capacity building, repeated exposure to information, and contextual learning [27]. The program consisted of three structured phases:

1. STAGE 1: CADRE TRAINING

A one-day training session was conducted using lectures, interactive discussions, and question-and-answer methods supported by audiovisual media. Training content focused on childhood TB transmission, early symptom recognition, preventive behaviors, stigma reduction, and effective communication strategies.

2. STAGE 2: FAMILY BASED ASSISTANCE

At this stage, Trained cadres conducted home visits over a one-week period to provide individualized education to parents using a standardized booklet on childhood TB prevention. This ensured message consistency and facilitated knowledge transfer at the household level.

3. STAGE 3: COMMUNITY COUNSELING

Cadres participated in a community-wide counseling session integrated with the "Merdeka TBC" campaign, reinforcing key prevention messages and promoting collective awareness.

E. DATA COLLECTION INSTRUMENTS AND PROCEDURES

Data were collected using structured questionnaires developed in accordance with national TB guidelines and validated educational materials. The instruments assessed knowledge and awareness related to childhood TB prevention and were administered before and after the intervention. Knowledge scores were categorized into poor, sufficient, and good based on predetermined percentage thresholds. In addition, an evaluation checklist was used to assess cadres' perceptions of training quality, relevance of materials, clarity of delivery, and usefulness for community counseling. Data collection was conducted by trained facilitators to ensure standardization and minimize information bias [29].

F. DATA ANALYSIS

Data analysis was performed using descriptive statistical methods. Frequencies and percentages were calculated to describe participant characteristics and changes in knowledge categories before and after the intervention. The analysis focused on practical program outcomes rather than hypothesis testing, consistent with the objectives of community service–based research and public health program evaluation [30]. Results were presented in tabular form to facilitate transparency and replication.

G. ETHICAL CONSIDERATIONS

Ethical approval was obtained from the Ethics Committee of Poltekkes Kemenkes Surabaya. Written informed consent was secured from all participants prior to data collection. Confidentiality and anonymity were maintained by using coded identifiers and restricting access to research data. Participation was voluntary, and participants were informed of their right to withdraw at any stage without consequences. Ethical procedures followed national and international guidelines for community-based health research [31].

III. RESULT

The actual participation of cadres in the community service activity entitled Empowering Cadres to Increase Parental Awareness of Tuberculosis (TB) in children Prevention in Pacarkembang District, Surabaya involved 30 community health workers (KSH).

General Data

1. Characteristics Data of KSH

TABLE 1
Characteristics Data of KSH in RW 08, Pacar Kembang Urban Village, dated August 20, 2025.

No	Description	Number	%
	Educational Background		
1	Elementary School (SD)	3	10
2	Junior High School (SMP)	5	17
3	Senior High School (SMA)	19	63
	Bachelor's Degree	3	10
	Total	30	100
	Occupation		
1	Housewife	28	93
2	Early Childhood Educator	2	7
3	Entrepreneur	0	0
	Total	30	100
	Length of Service as a Cadre		
1	1–2 years	0	0
2	3–5 years	6	20
3	More than 5 years	24	80
	Total	30	100

TABLE 1 shows the characteristics of the Community Health Workers (KSH) Most of the cadres had a senior high school (SMA) education background, accounting for 63% (19 individuals). Almost all of them were housewives (93%, or 28 individuals), and the majority had served as cadres for more than five years (80%, or 24 individuals).

2. Characteristics of Parents Accompanied by KSH

TABLE 2
Characteristics of Parents Accompanied by KSH in RW 08, Pacar Kembang Urban Village – August 20, 2025.

No	Description	Total	%
	Educational Background		
1	Elementary School (SD)	5	17
2	Junior High School (SMP)	1	3
3	Senior High School (SMA)	18	60
4	Bachelor's Degree	6	20
	Total	30	100
	Occupation		
1	Civil Servant (Non-Teacher)	0	0
2	Civil Servant (Teacher)	1	3
3	Non-Civil Servant Teacher	1	3
4	Private Employee	7	23
5	Trader	1	3
6	Farmer	0	0
7	Laborer	2	7
8	Military/Police	0	0

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	(TNI/POLRI)		
	Total	30	100

TABLE 2 shows the characteristics of Community Health Workers (KSH) Most of the cadres had a senior high school education (63%, or 19 individuals). Nearly all of them were housewives (93%, or 28 individuals), and the majority had served as cadres for more than five years (80%, or 24 individuals).

Specific Data

1. **Cadres' Understanding of Childhood TB Prevention**

TABLE 3
Frequency Distribution of Community Health Workers' (KSH) Understanding of Childhood TB Prevention in RW 08, Pacar Kembang Urban Village – August 20, 2025

No	Description	Before		After	
		Total	%	Total	%
	Knowledge Level				
1	Poor	0	0	0	0
2	Fair	3	10	2	6.7
3	Good	27	90	29	93.3

TABLE 3 shows the cadres' understanding before being given the material, with a small portion falling into the adequate category (10%) (3 people), and after being given the material, a small portion remained in the adequate category (6.7%) (2 people). Meanwhile, the understanding of cadres before being given the material was almost entirely in the good category (90%) (27 people), and after being given the material, almost all remained in the good category (93.3%) (29 people).

2. Parents' understanding of cadres' understanding of TB prevention in children

TABLE 4
Frequency Distribution of KSH Understanding of Cadres' Understanding of TB Prevention in Children in RW08, Pacar Kembang Village, August 20, 2025

No	Description	Before		After	
		Total	%	Total	%
	Knowledge Level				
1	Poor	1	3.3	1	3.3
2	Fair	4	13.3	6	20
3	Good	25	83.4	23	76.7

TABLE 4 shows parents' understanding before being given the material: a small portion in the poor category (3%) (1 person), adequate (13.3%) (4 people), and almost all in the good category (83.4%) (25 people). After the material was provided, a small portion fell into the poor category (3.3%) 1 person, adequate (20%) 6 people. Almost all fell into the good category (76.7%) 23 people.

3. Evaluation of Cadres

TABLE 5
KSH Evaluation of the Implementation of Cadre Empowerment Activities or as Counselors and Mentors for Families with Elementary School Children at Risk of Tuberculosis in RW 08, Pacar Kembang Village, Surabaya, August 20, 2025

No	Indicator	Good		Fair		Poor		Total	
		F	%	F	%	F	%	F	%
1.	Committee preparation in terms of facilities and venue	30	100					30	100
2.	Committee preparation in terms of material package	30	100					30	100
3.	Committee preparation in terms of catering	27	90	3	10			30	100
4.	Learning materials were well-structured and easy to understand	29	96.6	1	3,33			30	100
5.	Learning materials were relevant and aligned with expectations	29	96.6	1	3,33			30	100
6.	Materials were sufficient to support guidance for parents	28	93.3	2	6.66			30	100
7.	Materials helped me provide clear explanations to parents	28	93.3	2	6.66			30	100
8.	Presenter had strong mastery of the subject	26	B6.6	4	13.3			30	100
9.	Allotted time for material delivery was sufficient	28	93.3	2	13.3			30	100
10.	Presenter delivered content clearly, understandably, and practically	28	93.3	2	13.3			30	100
11.	Presenter responded well to participant questions	28	93.3	2	13.3			30	100
12.	Overall benefit of the mentoring activity	28	93.3					30	100
	Average (%)							**100**	**100**

TABLE 5 Evaluation of Community Health Workers (KSH) on the Implementation of the Empowerment Activities as Educators and Mentors for Families with Primary School Children at Risk of Tuberculosis in RW 08, Pacar Kembang Urban Village, Surabaya. Almost all respondents were in the good category (ranging from 93.3% to 100%), corresponding to 26 to 30 individuals, while the

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Fair category ranged from 3.33% to 13.3%, representing 1 to 4 individuals.

FIGURE 1 Preparation Empowering Cadres to Increase Parental Awareness of Tuberculosis (TB) Prevention in Children in Pacarkembang District, Surabaya.

FIGURE 2 Opening of Pengabmas Lecturers and students in the process Empowering Cadres to Increase Parental Awareness of Tuberculosis (TB) Prevention in Children in Pacarkembang District, Surabaya.

FIGURE 3 Speaker on Empowering Cadres to Raise Parental Awareness about Preventing Tuberculosis (TB) in Children in Pacarkembang District, Surabaya

FIGURE 4 Pengabmas team of lecturers and students in the process Empowering Cadres to Increase Parental Awareness of Tuberculosis (TB) Prevention in Children in Pacarkembang District, Surabaya.

IV. DISCUSSION

The findings of this study demonstrate that the cadre empowerment program was effective in improving cadres' understanding and parental awareness of childhood tuberculosis (TB) prevention in RW 08 Pacarkembang, Surabaya. The increase in cadres categorized as having "good" knowledge following the intervention indicates that structured training combined with practical mentoring activities can strengthen cadres' capacity to function as community health educators. This improvement suggests that cadres are receptive to targeted educational interventions when learning materials are contextually relevant, delivered using interactive methods, and supported by clear educational media.

The observed improvement among parents, particularly the increase in the "sufficient" knowledge category, reflects the indirect impact of cadre empowerment on family-level awareness. Although the proportion of parents with "good" knowledge showed a slight decrease, the overall shift from lower to moderate understanding suggests a process of knowledge transition rather than regression. This phenomenon may indicate that parents became more aware of the complexity of TB prevention after receiving more detailed information, leading to more cautious self-assessment of their knowledge. Such outcomes are commonly reported in health education studies where increased exposure to information enhances critical awareness rather than immediately elevating confidence levels [32].

The results also highlight the importance of repeated exposure and interpersonal communication in health education. Cadre-led home visits and community counseling sessions allowed for clarification of misconceptions, personalized explanations, and reinforcement of key preventive messages. This approach aligns with family-centered TB prevention strategies that emphasize sustained engagement and trust-building between health educators and community members [33]. Overall, the findings support the assumption that empowering cadres serves as an effective intermediary mechanism to extend TB prevention knowledge from health services to households.

The results of this study are consistent with previous research demonstrating that cadre empowerment and community-based education significantly improve TB-related knowledge and preventive behaviors. Several studies have reported that trained health cadres contribute positively to early detection, stigma reduction, and improved community compliance with TB prevention measures [34], [35]. Similar to the present findings, cadre training interventions that incorporate interactive learning and practical guidance have been shown to produce measurable improvements in knowledge retention and communication skills [36].

Comparatively, the modest improvement in parental knowledge observed in this study aligns with evidence

indicating that changes at the household level often occur more gradually than changes among trained health workers. Parents' knowledge and behavior are influenced by multiple factors, including educational background, socioeconomic conditions, cultural beliefs, and competing household responsibilities [37]. Studies conducted in other urban settings have reported that parental TB awareness improves more effectively when education is delivered repeatedly over longer periods or combined with broader social support mechanisms [38]. Therefore, the findings of this study reinforce the importance of continuous cadre involvement rather than one-time educational activities.

From a public health perspective, the findings have important implications for TB prevention strategies targeting children. Cadre empowerment represents a scalable and cost-effective approach to strengthening community participation in TB control programs, particularly in urban areas with limited health personnel. By positioning cadres as local educators and mentors, health systems can enhance outreach, promote early preventive behaviors, and reduce reliance on facility-based services alone. Furthermore, integrating cadre empowerment into routine primary health care activities supports national TB elimination goals that emphasize community engagement and preventive action [39].

The findings also suggest that educational media, such as booklets, play a supportive role in reinforcing verbal education. However, their effectiveness depends on cadres' ability to contextualize the content and adapt explanations to parents' literacy levels. This highlights the need for continuous skill development among cadres, particularly in health communication and counseling techniques.

Despite its strengths, this study has several limitations that should be considered when interpreting the results. First, the study employed a non-randomized pre–post design without a control group, which limits causal inference. Improvements in knowledge may have been influenced by external factors, such as concurrent public health campaigns or informal information sharing within the community. Future studies could incorporate comparison groups or quasi-experimental designs to strengthen internal validity [40].

Second, the relatively short duration of the intervention and follow-up period may not fully capture long-term changes in parental knowledge or preventive behaviors. Knowledge gains do not necessarily translate into sustained behavioral change, particularly for complex health behaviors such as TB prevention. Longitudinal studies with extended follow-up are needed to assess whether increased awareness leads to consistent preventive practices and reduced TB risk among children [41].

Third, the assessment relied primarily on self-reported knowledge measures, which are subject to response bias. Participants may overestimate or underestimate their understanding due to social desirability or limited self-awareness. Incorporating observational measures or behavioral indicators, such as household ventilation practices or participation in TB screening, could provide a more comprehensive evaluation of intervention impact [42].

Nevertheless, the study provides valuable insights into the practical implementation of cadre empowerment in an urban Indonesian context. The findings underscore the importance of strengthening community-based human resources to support TB prevention among children. Future programs should consider expanding the scope of cadre training to include behavioral change techniques, stigma management, and family counseling skills. Additionally, collaboration between health centers, local governments, and community organizations is essential to ensure sustainability and broader program reach.

In conclusion, this study demonstrates that cadre empowerment is a feasible and effective strategy to enhance parental awareness of childhood TB prevention. While further research is needed to optimize intervention design and assess long-term outcomes, the findings support the integration of cadre-led education into comprehensive TB prevention efforts at the community level.

V. CONCLUSION

This study aimed to evaluate the effectiveness of a community-based cadre empowerment program in increasing parental awareness of childhood tuberculosis (TB) prevention in the Pacarkembang District, Surabaya. The findings indicate that the intervention achieved its primary objective by strengthening both cadre capacity and parental understanding through structured education and family-based assistance. Quantitatively, the proportion of health cadres categorized as having good knowledge increased from 90.0% prior to the intervention to 93.3% after program implementation, while no cadres remained in the poor knowledge category. Among parents of school-aged children, the proportion with sufficient understanding of childhood TB prevention increased from 13.3% to 20.0%, reflecting a positive shift in awareness following cadre-led mentoring and counseling activities, although a small proportion of parents (3.3%) continued to demonstrate limited understanding. These results suggest that empowering cadres as community educators can effectively extend TB prevention messages from primary health services to the household level. The structured use of educational media, particularly booklets combined with interpersonal communication during home visits and community counseling sessions, contributed to improved comprehension and facilitated contextual learning among parents. Despite these encouraging outcomes, the modest magnitude of change in parental knowledge highlights the complexity of achieving rapid behavioral and cognitive shifts at the family level, especially within a relatively short intervention period. Therefore, future work should focus on implementing longitudinal and multi-cycle empowerment programs with extended follow-up to assess the sustainability of knowledge gains and their translation into preventive behaviors. Further studies are also recommended to incorporate comparative or quasi-experimental designs, integrate behavioral and environmental outcome measures, and explore the influence of socioeconomic and cultural factors on parental

engagement in TB prevention. Expanding cadre training to include advanced communication strategies and behavioral change techniques may further enhance program effectiveness. Overall, the findings support the integration of cadre empowerment into routine primary health care and community TB control initiatives as a feasible and sustainable strategy for strengthening childhood tuberculosis prevention in urban settings.

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DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

Indriatie was responsible for conceptualizing and designing the study, coordinating the community-based intervention, conducting data collection and analysis, and preparing the initial manuscript. Aida Novitasari contributed to the development of educational materials, supported the implementation of cadre training and mentoring activities, and provided substantive revisions to the manuscript. Nurhasanah assisted with field data collection, community coordination, supervision of program implementation, and critical review of the final manuscript. All authors approved the final version of the manuscript.

DECLARATIONS

ETHICAL APPROVAL

Information is not available.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests

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