Family Behaviour In The Prevention of Pulmonary Tuberculosis Transmission Among Children

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Abstract

Introduction: Tuberculosis (TB) remains a critical public health priority in Indonesia, with household contacts of patients, particularly children, constituting a high-risk group for infection. The family unit plays a pivotal yet complex role in either mitigating or facilitating transmission within domestic settings. Objective: This study aimed to compare the knowledge, attitudes, and preventive practices (KAP) related to TB between families with and without household TB contacts in Medan, Indonesia. Methods: A comparative cross-sectional study was conducted across eight public health centers in Medan. A total of 100 family respondents (50 with child household TB contacts and 50 without) were recruited. Data on sociodemographics and TB-related KAP were collected via a validated, structured questionnaire and analyzed using Chi-square tests in SPSS 22.0. Results: A stark, inverse distribution was observed. Families with household TB contacts demonstrated significantly poorer knowledge (94.0% poor vs. 6.0% good), less positive attitudes (66.0% good vs. 86.0% good), and markedly inferior preventive practices (12.0% good vs. 93.0% good) compared to families without contacts (p=0.027, p=0.019, and p=0.007, respectively). Conclusions: The study reveals a critical paradox: families at the highest risk of transmission possess the lowest KAP levels for prevention. This indicates a profound failure of current TB contact investigation and education paradigms to effectively penetrate high-risk households. Urgent recalibration of national TB control strategies is needed to implement intensive, household-centered behavioral interventions to break the chain of intra-familial transmission.

Keywords: Tuberculosis; Knowledge, Attitudes, Practice; Household Contacts; Health Education; Indonesia.

INTRODUCTION

Tuberculosis is an infectious illness that poses a significant health challenge and is among the main causes of mortality globally (Nurany, 2023). The World Health Organization estimated that in 2020, 10 million people worldwide would be infected with tuberculosis (TB), comprising 5.6 million men, 3.3 million women, and 1.1 million children. The majority of new cases, 43%, were reported in Southeast Asia, with Africa and the West Pacific accounting for 25% and 18%, respectively (World Health Organization, 2020). TB affects all nations and age groups, and is both curable and preventable, being the second leading cause of death globally, following COVID-19 (Sherman, 2023).

The Global Tuberculosis Report reports that the estimated number of people diagnosed with tuberculosis worldwide in 2021 will reach 10.6 million cases, or around 600,000 cases,

which is an increase from the previous year, namely 2020. Of the 10.6 million cases referred to, there were 6.4 million 60.3% people who have been diagnosed and are entering treatment, and 4.2 million (39.7%) people who have not been evaluated, diagnosed, or treated. Among them, there are 6 million men affected by cases, 3.4 million women and 1.2 million children. Deaths caused by tuberculosis can be said to be quite high overall. Around 1.6 million people died due to tuberculosis, this shows an increase in the number of deaths from the previous year which amounted to 1.3 million people. And there were also around 187 thousand people who died from tuberculosis–HIV (World Health Organization, 2022).

In 2021, the number of tuberculosis cases in Indonesia is estimated to be around 969 thousand, an increase of around 17% from the previous year, which amounted to 824 thousand people. Around 28 thousand people with drug-resistant tuberculosis, 144 thousand deaths due to tuberculosis and around 86% success in treatment (World Health Organization, 2022). North Sumatra has the largest number of tuberculosis cases in 2021, ranking 6th after West Java, Central Java, East Java, DKI Jakarta, Banten, and North Sumatra. In 2020, the worst cases of tuberculosis were found in Medan City, Deli Serdang, and Simalungun with the results of acid resistant bacilli (+). In addition, in 2021, the number of tuberculosis cases in Medan City has now exceeded 10% (around 1,000 cases), with a predetermined target of around 18 thousand cases (Kementerian Kesehatan RI, 2021) (Damanik, 2023).

Pulmonary tuberculosis (TB) is a significant public health issue in Indonesia. The Household Health Survey (SKRT) indicates that TB is the predominant respiratory and infectious illness. Tuberculosis in children results in growth abnormalities and may lead to mortality (Abimulyani, 2023). If tuberculosis in a child is not promptly treated, it may rapidly progress to parenchymal or tubercular pneumonia, miliary tuberculosis, bone tuberculosis (scrofuloderma), joint tuberculosis, abdominal tuberculosis, and perhaps meningitis (Siregar, 2021)(Yang, 2020) .

Tuberculosis is an airborne illness produced by germs that may persist in the atmosphere (Nurany, 2023). Bacteria in desiccated sputum that attach to dust may last for a further 8-10 days. An environment-based illness is a pathological condition characterized by defects in the function or morphology of an organ, resulting from human interaction with environmental factors that may induce disease (Fitriani, 2020) (Willis, 2025). Environmental risk factors for tuberculosis include housing density, humidity, temperature, ventilation/Air Change Per Hour (ACH), and daylighting (Meo, 2022).

Children are high risk group infected with tuberculosis. Children who had close contact with adult tuberculosis patients have a higher risk for tuberculosis infection due to disturbance

in immune defenses (Holmberg, 2019) .Tuberculosis in children is important in TB control program and reflects the effectiveness of tuberculosis control programs in adults. Undetected tuberculosis infection in children furthermore could be a source of new tuberculosis infection and increase the incidence of tuberculosis (Jaganath, 2022). Therefore, result the strategy of tuberculosis elimination to be ineffective.

In tuberculosis control program, the role of the family is important. Family members can provide information about the disease, provide moral support, and prevent transmission of the disease (Saputro, 2024). The conduct of adult pulmonary TB patients residing with children significantly impacted the transmission of pulmonary tuberculosis to the children living in the same family (Abimulyani, 2023). Knowledge emerged as the main predictor, with an odds ratio (OR) of 10.2, indicating that respondents with limited knowledge were 10.2 times more likely to fail to adopt preventive behaviour (Nafisah, 2025).

In fact, there are still many pulmonary tuberculosis patients in the community and the possibility of tuberculosis transmission has occurred in the family level. In implementing the DOTS strategy, the role of the family is important in the tuberculosis control program including prevention measures and tuberculosis patient treatment. This study aims to analyze differences in knowledge and prevention measures of pulmonary tuberculosis transmission among children in household contacts in Medan.

METHODS

Site description

This study had been conducted in Medan city , involving eight health facilities such as Medan Area Health facility, Medan Tembung Health facility, Simpang Limun Health facility, Darussalam Health facility, Teladan Health facility, Pasar Merah Health facility and Kampung Baru Health facility.

Research design

This study was designed as *cross sectional comparaive* study. Samples were children age < 15 years old who live in the households contact with tuberculosis patients and who live without households contact with tuberculosis patients.

Sample size

The total number of 100 sample were included in this study consist of 50 children who live in households contact with tuberculosis patients and 50 children who live without households contact with tuberculosis patients.

Study instruments

The structured questionnaire used in this study, including socio-demography, knowledge, attitudes, and prevention measures regarding tuberculosis. Socio-demographic data including education of respondent, income, ownership of house, contact history. Knowledge information including tuberculosis symptoms, mode of transmission, prevention, and treatment. Attitude including perception of magnitude of the disease, symptoms, prevention and treatment. Prevention measures including prevention measures and treatment.

Study analysis

Data analysis was performed using the Statistical Package for Social Science (SPSS) Release 22.0 program. Chi square was used to analyze the difference prevention measures of tuberculosis transmission among children with and without households contact.

RESULT

The socio-demogrhapic characteristic of respondents were presented in Table 1 and 2. The mean age of respondent was 45(13.5). Majority respondents have high education of 66.0% and low income of 70.0%

Table 1. Distribution of respondents according to age

Variabel	Minimum	Maximum	Mean (SD)
Age	21	77	45 (13.5)

Table 2. Distribution respondents according to education and income

Variable	Children live in households contacts	Children did not live in households contact	Total
Education			
High	27 (52.9%)	39 (79.6%)	66 (66.0%)
Low	24 (47.1%)	10 (20.4%)	34 (34.0%)
Income			
≥ 2,9 million	10 (20.0%)	20 (40.0%)	30 (30.0%)
< 2,9 million	40 (80.0%)	30 (60.0%)	7 70 (70.0 %)

In this study, family with children who did not live and contact with tuberculosis patients have more good knowledge, while family with children who live and contact with tuberculosis patients have more poor knowledge. Of Chi square analysis found there was a significance difference in knowledge regarding tuberculosis between families with and without households contacts ($p<0.05$) (Table 3).

The distribution of knowledge levels is nearly inverse between the cohorts. Among respondents categorized as Children live in households contacts, the vast majority exhibited poor knowledge (47 respondents, 94.0%). Only a small minority (3 respondents, 6.0%) were assessed as having good knowledge. Conversely, among respondents in the Children did not live in households contact group, the distribution is starkly opposite: the overwhelming

majority demonstrated good knowledge (46 respondents, 92.0%), with only a small proportion (4 respondents, 8.0%) categorized as having poor knowledge. The p-value of 0.027 indicates that the observed association between household contact status and knowledge level is statistically significant at a conventional alpha level of 0.05.

Table 3. Cross tabulation knowledge of respondents

Knowledge	Children live in households contacts	Children did not live in households contact	*p*
Good	3 (6.0%)	46 (92.0%)	0.027
Poor	47 (94.0%)	4 (8.0%)	

A good attitude was more found (86.0%) in family with children who did not live and contact with tuberculosis patients than family with children who live and contact with tuberculosis patients (66.0%). Of the Chi Square analyisis found there was a significance difference in attitude regarding tuberculosis prevention between families have children who live with and without households contacts (Table 4).

Table 4. Cross tabulation attitude of respondents

Attitude	Children live in households contacts	Children did not live in households contact	*p*
Good	33 (66.0%)	43 (86.0%)	0.019
Poor	17 (34.0%)	7 (14.0%)	

For good practice in prevention measures was more 93% infamilies have chidren without households contacts than families have children with households contacts (13.7%). Of Chi square analysis showed , p< 0.05 there was a significance difference in practice regarding tuberculosis prevention between families with and without households contacts, p<0,05 (Table 5).

Table 5. Cross tabulation practice of respondents

Practice in prevention measures	Children live in households contacts	Children did not live in households contact	*p*
Good	6 (13.7%)	48 (93.0%)	0.007
Poor	44 (86.3%)	2 (7.0%)	

DISCUSSION

Knowledge is a very important domain for the formation of a person's behavior. Behavior that is based on knowledge will be more lasting than behavior that is not based on knowledge (Notoatmodjo, 2018). The results of this study found that there were differences in knowledge regarding tuberculosis between families with children who live, with and without household contact. Misunderstandings arise due to a lack of knowledge and awareness among families about tuberculosis and its transmission to children (Aja, 2022). Many families believe that their children are healthy and are not at risk of contracting tuberculosis in the home environment. Fear of tuberculosis stigma arises from misunderstandings related to

tuberculosis (Mujahidah, 2023). When a family member is diagnosed with tuberculosis, the majority of families in Indonesia experience various negative responses, such as shame, fear of tuberculosis stigma, and anxiety about death (Rakhmawati, 2019).

The potential influence of direct exposure and experience on understanding tuberculosis prevention in the domestic environment (Agustina, 2017). Individuals who have children and live in households with tuberculosis patients may have limited understanding of the definition of the disease, its aetiology, transmission, and prevention strategies, even though they are directly exposed (Pangaribuan et al., 2020). Poor knowledge of household contact will increase the risk of vulnerability, especially for households with children under 5 years of age (World Health Organizations, 2025). Household contacts (HHC) play a role in the increase in TB cases among children, where inadequate contact investigation (CI) and preventive therapy (PT) are caused by a lack of knowledge, thus necessitating community-based family education (Rahmawati, 2020). Education about tuberculosis will increase the knowledge and practices of parents and the community regarding tuberculosis (Agustin, 2023). Education provided to families exposed to tuberculosis (TB) can stop transmission within households, reflecting the success of providing information to increase screening opportunities (Jember, 2023).

Attitude is a form of someone's readiness or willingness to do something, not a form of action carried out on the basis of certain motives (Zuidah, 2021). The results showed that the attitude of families who do not have children in household contact with tuberculosis patients is better than the attitude of the family who have children in household contact related to tuberculosis prevention. The function of attitude will not necessarily be an action as a form of open reaction but can be in the form of a preciposition of an action or behavior which is also a form of closed reaction (Wongchana, 2024). Knowledge is one of the factors that influence attitude. The higher the knowledge possessed will contribute to the formation of good attitude. The formation of attitudes can not be separated from the influencing factors such as personal experience, culture, other people who are considered important, the mass media, and emotional factors from individuals (Masrizal, 2023).

The differences in attitudes and practices found in this study can be understood as a reflection of a combination of structural risk factors (living in the same household as a TB patient) and behavioural factors (knowledge, perceptions, and prevention skills) (Wongchana, 2024). Ongoing health education and optimal environmental conditions, including ventilation and sanitation, are crucial for tuberculosis prevention. Enhancing interpersonal contact between healthcare professionals and the population is essential for optimizing tuberculosis control results, particularly in the post-pandemic context (Tetelepta, 2025).

The results of this study found that there were differences in the prevention of tuberculosis transmission in family with and without households contacts. Most of the families with children with households contact have less transmission prevention measures, on the contrary the families with children without households contact has good transmission precautions. The formation of an attitude to an action requires several supporting factors, one of which is a form of support (support) from others (Indarti, 2021). This form of support or motivation may be less available to infected family members compared to non-infected family members. Practice is the final form of behavior manifestation, where knowledge and attitude are very influential in the formation of one's practices. The results of the study showed that most of family without house holds contacts had preventive measures for the transmission of pulmonary TB disease which were compared to family with households contacts.

CONCLUSION

This study clearly shows significant inequalities in knowledge, attitudes, and practices related to the prevention of pulmonary tuberculosis transmission among households. The results reveal a worrying paradox: families living with tuberculosis patients, who are at the highest risk of transmission, demonstrate much poorer knowledge, less supportive attitudes, and inadequate preventive measures compared to families who do not have household contact with tuberculosis patients. These findings indicate a critical gap in the delivery of family-based tuberculosis education and current contact investigation protocols. Tuberculosis control programmes must immediately shift from passive case detection to intensive household-based health promotion strategies. Specialised educational interventions targeting households with active cases are urgently needed to improve health literacy and behavioural compliance, thereby breaking the chain of transmission to vulnerable children.

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