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The Impact of Education on TB Prevention in Stunted Children in the Working Area of the Kosiwo Health Center, Kepulauan Yapen Regency

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Abstract: Tuberculosis (TB) is a serious infectious disease that continues to be a global health challenge, particularly in Indonesia. Children with stunting are at a higher risk of contracting TB due to their weakened immune system caused by malnutrition. This study aims to analyze the impact of education on TB prevention in stunted children in the working area of the Kosiwo Health Center, Kepulauan Yapen Regency. The research method used was a quantitative approach with a quasi-experimental design, involving parents and caregivers of stunted children as respondents. Data were collected through questionnaires administered before and after the educational intervention. A total of 45 participants were selected using a total sampling method. Data were collected before and after the intervention using a validated and reliable questionnaire on children's knowledge of tuberculosis (TB), with a Cronbach's alpha of 0.946 for the TB knowledge questionnaire. The results were analyzed using the Paired T-Test, which showed that the mean knowledge score concerning TB transmission in children was 14.89 before the intervention, increasing by 9.78 points to 24.67 afterward, with a p-value of 0.000, which is below $\alpha = 0.05$.

Keywords: TB, stunting, education, prevention, Children

1. INTRODUCTION

Tuberculosis (TB) is one of the infectious diseases that remains a global health issue, including in Indonesia, particularly in the Kepulauan Yapen Regency. According to data from the, Indonesia ranks third in the world for the highest number of TB cases, following India and China. Children are among the vulnerable groups affected by TB. In children, especially those with stunting, the risk of contracting TB increases due to their generally weakened immune system caused by chronic malnutrition (Riskesdas, 2018; WHO, 2022).

Stunting is a condition of impaired growth in young children caused by prolonged malnutrition, which leads to children being shorter than the standard height for their age. This condition also weakens the immune system, making stunted children more vulnerable to infections such as TB. In the working area of the Kosiwo Health Center, Kepulauan Yapen Regency, both stunting and TB in children represent significant public health challenges that require serious attention, considering the geographical factors that may hinder access to information and health services(Rumaseb et al., 2020).

Children with stunting have a higher risk of developing various health issues, one of which is infectious diseases like tuberculosis (TB). Tuberculosis is an infectious disease caused by the *Mycobacterium tuberculosis* bacteria, which primarily affects the lungs but can also spread to other organs. Stunted children have a weakened immune system, making them more susceptible to infections, including TB(Haerana *et al.*, 2021).

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The impaired immune function in stunted children is caused by a lack of nutrition, which affects their ability to fight infections. Malnutrition, particularly during infancy and childhood, can lead to a decline in the function of immune cells crucial for fighting pathogens, including the bacteria that cause TB. Moreover, the malnutrition leading to stunting can slow down the body's recovery process from illness and infection, increasing the likelihood that children will contract TB and worsening the impact of the disease (Jaganath and Mupere, 2012; Dauphinais *et al.*, 2024)

Stunting is not only a direct risk factor for TB infection, but it is also associated with increased disease severity if the child becomes infected. Stunted children who contract TB tend to experience more serious complications because their weakened immune system cannot effectively fight the infection. Additionally, the interaction between stunting and TB can create a dangerous cycle, where stunting worsens the severity of TB, while TB infection can further deteriorate the child's nutritional status, exacerbating the existing stunting condition(Agustia, 2020; Hermawati and Sastrawan, 2020)

Therefore, children with stunting require special attention in both the prevention and treatment of TB, given their higher vulnerability to infection and the impact of the disease. Preventing stunting and improving children's nutritional status are crucial to reducing their risk of TB and other infectious diseases. This highlights the importance of providing education to parents to prevent TB in stunted children. Health education for parents and the community about TB prevention is a key strategy in reducing TB cases among children, especially those with stunting. This education includes raising awareness about the importance of maintaining hygiene, ensuring adequate nutrition, and conducting regular health check-ups. Several studies have shown that increasing knowledge and awareness through education can help reduce the incidence of infectious diseases such as TB across various community groups (Yanti et al., 2020).

This study aims to examine the impact of education on the prevention of TB in stunted children in the working area of the Kosiwo Health Center, Kepulauan Yapen Regency. The results of this study are expected to contribute to the development of effective, education-based intervention programs that are tailored to the local social and cultural conditions. Thus, the goal is to create a more informed and capable community in preventing TB, especially in children experiencing stunting.

2. METHODE

The research design used is a one-group pretest-posttest design, which examines cause-and-effect relationships without involving a control group. The study will be conducted in the working area of the Kosiwo Community Health Center, Yapen Islands Regency, from May to October 2024. The intervention group in this study will receive educational treatment. The study will begin with a pre-test, and after the intervention is applied, a post-test will be administered.

The population in this study consists of mothers of stunted children in the working area of the Kosiwo Community Health Center, with a total of 45 participants. The sampling technique used in this study is total sampling, meaning that the entire population will be included as the research sample, resulting in a total of 45 respondents. Data in this study were collected before and after the intervention using a validated and reliable questionnaire on a questionnaire on children's knowledge of tuberculosis (TB), with Cronbach's alpha values of 0.946 for the children's knowledge of TB questionnaire. Data analysis will be conducted using SPSS software. The first step is editing, where all completed questionnaires from respondents will be collected. Next, coding will be performed by assigning specific code numbers to facilitate data entry. The third step is scoring, where the values or scores for each variable will be calculated. The fourth step is data entry or tabulation, where all data will be entered into tables based on the assigned codes. Finally, data will be analyzed using descriptive analysis to describe the characteristics of the respondents and research variables. A paired t-test will be performed if the data are normally distributed, and if not, a Wilcoxon signed-rank test will be used. This study has received ethical approval from the Research Ethics Committee of YATSI Madani University, with ethics number: 272.LPM-UYM/VIII/2024.

3. RESULT

Respondent Characteristics

The characteristics of the respondents in this study can be seen in the following table:

Table 1. Respondent Characteristics

Varieble	N	%
Child's Gender		
Male	17	37.8
Female	28	62.2
Education Level		
Not in School	4	8.9
Elementary School	14	31.1
Junior High School	4	8.9
Senior High School	23	51.1
Mother's Age		
17-25 Year	12	26.7
26-35 Year	22	48.9
36-45 Year	11	24.4

Based on the data in Table 1 above, it can be seen that the most common gender of the children is female, accounting for 62.2%, while males represent 37.8%. The highest distribution of mothers' education levels is high school graduates at 51.1%, followed by elementary school at 31.1%, junior high school at 8.9%, and no formal education at 8.9%.

Mothers' Knowledge About Tuberculosis Transmission in Children

The distribution of mothers' knowledge about tuberculosis (TB) transmission in children before and after the intervention can be seen in the following table:

Table 2. Knowledge of Tuberculosis Transmission in Children

Knowledge About TB Transmission	Pretest		Postest	
	n	%	N	%
Good	-	-	39	86,7
Enough	14	31,1	6	13,3
Poor	31	68,9	-	-

Based on the data from the distribution of mothers' knowledge about tuberculosis (TB) transmission in children in Table 2 above, it shows that the highest level of knowledge among mothers before the intervention was in the "poor" category at 68.9%. After the intervention, there was a change, with the number of mothers classified as having "good" knowledge increasing to 86.7%.

The Impact of Education on Mothers' Knowledge About TB Transmission in Children

The results of the statistical analysis of The Impact of Education on Mothers' Knowledge About TB Transmission in Children are presented in the table below:

Table 3. Analysis of the Impact of Education on Mothers' Knowledge About TB Transmission in Children

Knowledge About TB Transmission	Mean	N	SD	P Value
Pretes	14.89	45	2.604	0,000
Postest	24.67	45	2.594	

Based on the analysis of the impact of education on mothers' knowledge about TB transmission in children, it can be observed that the average mean score before the intervention was 14.89. After the educational intervention, there was an increase in the mean score related to mothers' knowledge about TB transmission in children by 9.78, resulting in a new mean score of 24.67. The analysis yielded a p-value of $0.000 < \alpha = 0.05$.

4. DISCUSSION

The results of the study show that health education has a positive influence on the prevention of tuberculosis (TB) in stunted children in the working area of the Kosiwo Health Center. The education provided to parents on TB prevention, such as maintaining a clean lifestyle, proper sanitation, and improving nutritional intake, has increased parents' understanding and awareness of the risks and prevention of the disease. These findings align with previous studies indicating that enhancing knowledge through education plays a significant role in encouraging TB prevention behaviors within communities(Yanti et al., 2020).

Education plays a vital role in TB prevention among stunted children, particularly through increasing community awareness about nutrition and health. Various studies show that effective education can raise awareness and understanding of children's nutritional needs, which contributes to preventing stunting and related diseases like TB. Education on the importance of balanced nutrition can reduce the risk of stunting, a critical risk factor for TB. For instance, in Pagar Jati Village, education on healthy eating successfully improved community knowledge about children's nutritional needs(Syarifin *et al.*, 2024). In Taraweang Village, educational interventions showed a significant improvement in children's nutrition

knowledge, from insufficient to adequate and good levels (Fikram, B *et al.*, 2024). Education emphasizing the dangers of stunting and its impact on children's health, including the risk of TB, has proven effective. In Polokarto Village, participants' knowledge of stunting prevention increased by 13.46 points after the intervention (Widyastuti *et al.*, 2024). In Oesusu, 100% of participants understood stunting after education, highlighting the importance of knowledge in disease prevention (Lestari and Hanim, 2020).

Structured educational programs, such as those conducted in Pasir Peuteuy, demonstrate that effective socialization can enhance community knowledge about stunting and its prevention (Fauziah *et al.*, 2024). Despite the effectiveness of education, challenges remain in ensuring equitable access to information across communities, especially in remote areas. Continuous efforts are required to support all segments of the population so that TB and stunting prevention can be optimized.

Education plays a crucial role, particularly in vulnerable groups such as stunted children. Stunted children have weakened immune systems, making them more susceptible to infectious diseases like TB (Kemenkes RI, 2021). In this context, increasing parents' understanding of nutrition, environmental cleanliness, and TB symptoms can be an important step in reducing the risk of exposure and transmission of the disease at home(Astuti et al., 2024).

The relationship between stunting in children and the risk of developing tuberculosis (TB) is significant, as malnutrition, including stunting, has been identified as a critical risk factor for TB infection and disease progression. Research shows that children with impaired growth are more vulnerable to TB due to compromised immune function, which hampers their ability to fight Mycobacterium tuberculosis (MTB) infection. One study found that 24.6% of stunted children under five had a high prevalence of TB infection, with an adjusted prevalence ratio of 2.36 for stunted nutritional status(Bs. Titi Haerana *et al.*, 2021). Malnutrition, including stunting, causes immune deficiencies, making children more susceptible to infections like TB. Addressing malnutrition may help reduce TB incidence, as malnutrition is a modifiable risk factor(Jaganath and Mupere, 2012;Dauphinais *et al.*, 2024)

Children with stunting, especially those in close contact with TB cases, should be prioritized for interventions to prevent TB transmission (Bs. Titi Haerana *et al.*, 2021). There is a critical need for further research to explore the mechanisms linking malnutrition and TB, as well as the effectiveness of nutritional supplementation in improving outcomes (Vonasek *et al.*, 2022)

On the other hand, the challenges faced in implementing education in the working area of the Kosiwo Health Center include limited access to information due to infrastructure constraints, geographic location, and local cultural factors. This results in uneven distribution of health information, which ultimately affects the effectiveness of educational programs. Therefore, a community-based education approach involving community leaders or local health workers can be a relevant solution to enhance the reach of TB education programs, as suggested Mave et al., (2020). In conclusion, education positively contributes to preventing TB in stunted children. However, adaptive and participatory strategies are needed to enhance the effectiveness of educational programs, especially in areas with limited access, such as in the Kepulauan Yapen District. The development of education methods based on local culture and involving community leaders can increase the acceptance and understanding of the local population.

5. CONCLUSION

This study shows that health education has a significant impact on efforts to prevent TB in stunted children in the working area of the Kosiwo Health Center, Kepulauan Yapen Regency. The education provided to parents and caregivers has successfully improved their understanding of the importance of TB prevention through clean living habits, proper sanitation, and adequate nutrition. With this increased understanding, TB prevention actions within households have also improved, particularly among families with stunted children, who are vulnerable to infections. The increased knowledge gained through effective education enables the community to become more active in preventing TB, especially in the group of stunted children. This is expected to reduce the prevalence of TB in the Kosiwo Health Center area and, in turn, improve the overall health status of the community in Kepulauan Yapen Regency.

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