



## The Effect of Nutritional Status and Parental Income Level on the Incidence of Pulmonary Tuberculosis in Toddlers in the Working Area of the Manduamas Health Center, Central Tapanuli Regency

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### ABSTRACT

Nutritional status is one of the risk factors that can cause the incidence of tuberculosis. The income level of parents has a close relationship with economic status and will indirectly make TB transmission easier. Tuberculosis is an infectious disease that attacks the lungs and is caused by bacteria (*Mycobacterium tuberculosis*). This study aims to determine the relationship between nutritional status and parental income level to the incidence of pulmonary TB. This type of research is quantitative with a case control approach, the sample calculation in this study uses the total sampling technique using inclusion and exclusion criteria so that a sample of 17 controls and 17 cases is obtained. Then anthropometric measurements and interviews were carried out with parents of toddlers. Univariate and bivariate analysis were carried out using the chi square test, with the help of SPSS 25.0 with  $p = 0.05$ . Based on the results of the study, the  $p$  value  $< 0.05$  is the variable of TB/U nutritional status ( $p$ -value = 0.039, OR = 4.4, CI = 1.041-18.599). It is recommended to the Nutrition Officer of the Puskesmas to increase the activity of screening nutritional status in children under five.

### INTRODUCTION

The bacteria that cause the deadly disease tuberculosis (TB) is called *Mycobacterium tuberculosis*, or tuberculosis germ. Although they can also target other organs of the body, some of these microscopic creatures specifically target the lungs (Donsu, D.T.J., et al., 2019). The report on the Tuberculosis Treatment Program of the Indonesian People's Welfare Agency states that tuberculosis (TB) is the leading cause of death globally and among doctors who specialize in treating the disease. The estimated number of deaths from tuberculosis (9.8–11.3 million) is 10.6 million; of these deaths, 1.4 million (about 1.3–1.5 million) were caused by TB, and 187,000 (158,000–218,000) were caused by HIV.

According to the World Health Organization (WHO) World TB Report 2023, 7.5 million new cases of TB will be reported globally in 2022. Since the WHO began tracking TB cases globally in 1995, this number represents the largest number ever observed during the pre-TB period. data baseline. COVID (and the maximum number that can be verified beforehand) was 7.1 million people in 2019 and higher, up from 5.8 million in 2020 and 6.4 million in 2021. The figures in 2022 may include a large number of patients who have had tuberculosis over a long period of time, but their diagnosis and treatment have been delayed due to COVID-related disruptions affecting organizations and access to services. health and well-being. (WHO, 2023).

The report on the TB control program of the People's Welfare Agency of the Republic of Indonesia shows that, from 1995 to 2022, the disclosure of TB cases in children in Indonesia seems to have been stagnant due to a lack of serious disclosure; However, from 2008 to 2022, the picture looked realistic and fluctuated. There was a significant increase in the number of pediatric TB cases between 2014 and 2019. Meanwhile, there was a significant decrease in 2019–2020, but there was an increase in 2021–2022.

In 2019, 31,299 cases, or 0.49%, of all cases of tuberculosis in Indonesian children aged 5 to 14 years were reported, while 31,812 cases, or 0.5% of all cases in children aged 0 to 4 years were reported. Pediatric tuberculosis cases reached 63,111, or covering 845,000 cases overall, or 0.7% of all cases in Indonesia (Department of Health, 2020).

Factors that affect a person's risk of developing tuberculosis (TB) include age, sexual orientation, BCG vaccine status, health status, presentation aspects, and home environmental factors such as ventilation, lighting, humidity, and house thickness. (Indonesian Welfare Office, 2020).

A child's ability to prevent disease is highly dependent on his nutritional status. A child's nutritional history has a great influence on the child's resistance to tuberculosis (TB) bacteria. Adolescents with healthy nutritional status can stop the spread of the disease throughout the body, but malnourished children can contribute to the early development of pulmonary tuberculosis (TB) infection (Nadila NN, 2021).

The body's resistance to bacterial attacks is influenced by nutritional conditions, and every eating disorder will have an impact on the immune system's ability to fend off incurable diseases (Nadila NN, 2021). According to Girsang IV and Yovsyah in 2023, there are many things that cause the high rate of tuberculosis in young children, one of which can be caused by the condition of the child's diet (WHO 2018a). Immune system problems due to nutritional deficiencies can have an impact on a person. According to Crofton, the desire to eat can result in a diet that is low in nutritious nutrients, so it can weaken the body's defenses against disease at any age. (Danny R. and others, 2021).

Wages are the result of work, moreover, wages will have an impact on a person's way of life. Wages are closely related to poverty, individuals who have a decent wage more often have good financial levels as well. Monthly payments will affect a person's ability to maintain their well-being, as monthly wages affect teaching, information, food intake, medication and living conditions. (Yuniar I, et al. 2020)

Income can limit the fulfillment of the needs of their families and individuals. When the salary is higher but the level of consumption to meet needs remains the same, then the salary assignment used to meet needs will be reduced, so the family can be said to be prosperous. When a family or family salary increase completely changes the pattern of investment needs, in this case the family is not prosperous. (Suweningsih & Suwendra.2022)

Hutabaginda Health Center, Tarutung District is one of the health centers that has carried out TB screening for children. Based on data from the Hutabaginda Health Center e-PPGBM, the number of toddlers as of February 2024 is 1900 toddlers spread across 31 villages and 41 Posyandu. Based on SITB data from the Hutabaginda Health Center in 2024, the prevalence of confirmed TB of toddlers is 0.89% with a total of 17 toddlers confirmed TB. Treatment of pulmonary TB in children is carried out at the Hutabaginda Health Center, Tarutung District. Children with tuberculosis were treated for six to twelve months with at least three different types of treatment. Children's polyclinics require monthly check-ups for children. To minimize forgetting to take a prescription, children should take it every day, if possible, at the same time. Depending on the child's overall condition, the doctor will determine at the end of the sixth month whether to continue or stop treatment.

In the Working Area of the Hutabaginda Health Center, Tarutung Regency, researchers are interested in studying the influence of parental income level and nutritional status on the incidence of tuberculosis (TB) in toddlers. This curiosity is the result of the description of the data provided. Variables that affect the incidence of childhood tuberculosis at the Manduamas Health Center, Central Tapanuli Regency. However, this study is limited by several things because it uses secondary data such as parental income levels and nutritional conditions as measured by the TB/U index.

## METHODS

### Design, Location, Time

This research is quantitative and uses a case control research method. It uses statistical testing, specifically chi-square. Research is obtained through the use of statistical procedures or other quantification (measurement) methods, case control is a kind of analytical design that monitors the development of a disease based on a time series. Retrospective research design is referred to as outcomes. analytics that follow the process of disease travel backwards based on time order.

The research was carried out in the Manduamas Health Center Working Area, Jl. Sutomo No. 2 P Manduamas, Manduamas District, Central Tapanuli Regency, postal code 22565. The research will be carried out in February-March 2024.

### How to Select Samples

All information that is within a predetermined time frame and scope and is relevant to the researcher is referred to as a population. The case population in this study consisted of 17 people with pulmonary tuberculosis (TB) in toddlers aged 0-59 months as evidenced by health examinations. The control group in this study consisted of 1,883 children (aged 0-59 months) who had no confirmed cases of tuberculosis.

The sample strategy used in this study is total sampling. Total sampling is a sampling strategy where the number of samples is equal to the number of population, according to Sugiyono (2007). Sample: A 1:1 case-control ratio is used to select all the case and control of the study. The overall side was chosen because according to Sugiyono (2007), the population is 1:1, or less than 100, and the entire case population is used as a research sample. Children between the ages of 0 and 59 months who had pulmonary tuberculosis verified by medical professionals were classified as cases, while children in the same age range who did not have such a diagnosis were classified as controls. The inclusion and exclusion criteria for this study are as follows:

## Exclusion Criteria

- Toddlers aged 0-59 months who live in the Hutabaginda Health Center Area, Tarutung District
- Diagnosed with Pulmonary TB by a Doctor
- Willing to take measurements including height and weight

## Exclusion Criteria

Toddlers who were confirmed to have Pulmonary TB in the Hutabaginda Health Center Area, but did not receive treatment at the Hutabaginda Health Center

If the person/sample meets the Exclusion criteria, it means that they cannot participate in the study even if they meet the inclusion criteria.

**RESULTS****Respondent Characteristics**

Table 1. Frequency distribution of parental income levels

Parental Income	Case		Controls	
	n	%	n	%
> IDR 2,834,000	4	23,5	7	41,17
≤ Rp. 2,834,000	13	76,4	10	58,82
Total	17	100	17	100

Table 1. shows that the case group mostly has income under the Central Tapanuli MSE, which is ≤ Rp. 2,834,000 (76.4%). In the control group, most parents have less than the Central Tapanuli MSE, which is ≤ Rp. 2,834,000 (58.82%).

Table 2. Distribution of toddler frequencies by gender and age

Gender	Case		Controls	
	n	%	n	%
Women	6	37,5	7	43,75
Men - men	11	64,7	10	58,82
Total	17	100	17	100

  

Age	Case		Controls	
	n	%	n	%
1-3 Years	14	82,35	16	94,11
4-6 Years	3	17,64	1	5,88
Total	17	100	17	100

Table 2 shows that from the case group, most of them were men, namely 64.7%. In the control group, most of the men were 58.82%. In the case group, most of them were in the 1-3 year age bracket, which was 82.35%, while in the control group, most were in the 1-3 year age bracket, which was 94.11%.

Table 3. Frequency distribution of nutritional status by TB/U

TB/U	Case		Controls	
	n	%	n	%
Normal	6	3,75	12	70,5
Stunting	11	64,7	5	29,4
Total	17	100	17	100

Table 3 shows that the majority of toddlers have stunted height status, compared to 29.41% in the control group.

Table 4. The Effect of Nutritional Status with the Incidence of Pulmonary Tuberculosis in Children Under Five in the Working Area of the Manduamas Health Center

TB/U	Pulmonary TB		No Pulmonary TB		P-Value	OR	CI (95%)
	n	%	n	%			
Normal	6	3,75	12	70,58	0,039	4,4	1,041-18,599
Stunting	11	64,7	5	29,4			
Total	17	100	17	100			

Table 4 shows that in the case group, there were 11 toddlers (64.7%) with stunted height and 6 toddlers (3.75%) with normal height. In the control group, there were 5 people (29.4%) with stunted nutritional status and 12 toddlers (70.58%) with nutritional status based on normal TB/U. The number of cases of pulmonary tuberculosis in toddlers around the Manduamas Health Center is correlated with nutritional status based on height to age, this is shown by the findings of the TB/U statistical test which has a p-value of 0.039 ( $p\text{-value} \leq 0.05$ ), OR = 4.4 is a number produced based on the results of a statistical test using the Odd Ratio (OR) (average ratio of 95%: (L-U; 1,041-18,599). The OR value obtained showed that toddlers with stunted nutritional status were at a 4.4 times higher risk than toddlers with normal nutritional status.

Table 5. The Effect of Parental Income with the Incidence of Pulmonary Tuberculosis in Children Under Five in the Working Area of the Manduamas Health Center

Parental Income	Pulmonary TB (Cases)		No Pulmonary TB (control)		P-Value	OR	CI
	n	%	n	%			
> IDR 2,834,000	4	23,5	7	41,17	0,271	2,2	0,51
≤ Rp. 2,834,000	13	76,4	10	58,82			
Total	17	100	17	100			

Table 5 shows that the income of parents of toddlers who were confirmed to have Pulmonary Tuberculosis was 13 people (6.4%) with an income of ≤ Rp. 2,834,000 and 4 people (23.5%) with an income of > Rp. 2,834,000. In toddlers who did not have Pulmonary TB, there were 10 people (58.82%) with a parental income of Rp. ≤ Rp. 2,834,000 and 7 people (41.17%) with a parental income of > Rp. 2,834,000.

The results of the chi-square statistical test obtained a p-value of 0.271 ( $p\text{-value} \geq 0.05$ ), thus showing that there was no relationship between the number of cases of pulmonary tuberculosis in the Manduamas Health Center area and parental income.

According to the results of statistical tests conducted with OR (Odd Ratio), OR = 2.2 (normal interval of 95 percent) was obtained: (L-U; 0.5189.989). The OR value obtained shows that the income of parents of toddlers ≤ Rp. 2,834,000 has a risk of 2.2 times the risk of developing pulmonary TB compared to the income of parents of toddlers with a > of Rp. 2,834,000.

## DISCUSSION

### Nutritional Status of Toddlers in the Manduamas Health Center Working Area

According to the results of the study, six toddlers in the case group with normal height and eleven toddlers had stunted nutritional status, while five in the control group had stunted nutrition status and twelve toddlers had normal nutritional status. Chronic malnutrition called stunting is caused by malnutrition due to a lack of a previous diet. When assessing stunting based on nutritional status, the child's height or length, age, and gender are also taken into account. Stunting is difficult to achieve because of the tendency of society not to measure the height and length of young children.

A person's nutritional status is determined by what he eats in a certain period of time. As a result, depending on the nutrients available to the human body, the nutritional status of infants and toddlers will range from low to maximum. Baby and toddler food is used for their physical development. Because the growth, development, and health of toddlers correlates with the nutritional adequacy of infants and early childhood, nutritional status and growth can be used as a benchmark to track these relationships. It has a direct relationship with a well-rounded diet. The right diet for early childhood is necessary for its best growth and development. (Maryunani, 2010:258)

The balance between the nutrients needed by the body and the nutrients that come in produces a state called nutritional status (Maryunani, 2010: 258).

Incidence of Pulmonary Tuberculosis in Toddlers in the Manduamas Health Center Working Area Of the 34 toddlers in the study, 50% had pulmonary tuberculosis (TB), according to the study's findings, and the other 50% did not. According to the researchers, nutritional status, environmental factors, and family history are the main causes of pulmonary tuberculosis in toddlers. The immune system is weakened due to poor diet, malnutrition, and stunting, which can lead to a number of infectious diseases, including pulmonary tuberculosis.

Complex species of tuberculosis mycobacteria, such as *M. africanum*, *M. bovis*, and *M. canetti* (as well as other non-human organisms), are the cause of tuberculosis (TB). Small respiratory tracts (between 1 and 5 mm) contaminated and excreted by tuberculosis patients through mucosal fluid are a means of spreading the disease. When inhaled by another person, the droplets enter the alveoli through close contact.

The air can carry the TB virus from person to person. Those infected secrete large (more than 100 u) and small (between 1 and 5 u) droplets when they laugh, sneeze, cough, talk, or sing. Large droplets remain in place,

while small droplets spread through the air and are ingested by sensitive individuals (Ministry of Health of the Republic of Indonesia, 2014).

### **The Relationship between Nutritional Status and the Incidence of Pulmonary Tb in the working area of the Manduamas Health Center**

Based on this study which analyzed the relationship between nutritional status and the incidence of pulmonary TB at the Hutabaginda Health Center, of the 34 toddlers, 17 toddlers (50%) were confirmed to have Pulmonary TB and 11 toddlers (62.5%) had stunted nutritional status. Based on the results of the chi-square statistical test, it was shown that the prevalence of pulmonary tuberculosis (TB) in toddlers in the work area of the Hutabaginda Health Center was related to nutritional status based on height by age ( $p$ -value = 0.039;  $p$ -value < 0.05) with OR = 4.4. Based on the OR value, the risk of toddlers with nutritional status Stunting Pulmonary tuberculosis is 4.4 times higher in toddlers with normal nutritional status.

This research is in line with Yusuf NR's research in 2018, The Relationship between Diet and Nutrition and the Incidence of Pulmonary Tuberculosis, which was conducted at the Lung Disease Treatment Center (BP4) Lubuk Alung, West Sumatra. Of the 20 toddlers, 14 toddlers were confirmed to have pulmonary tuberculosis with poor nutritional status and had a  $p$  = 0.006 value, meaning that there was a relationship between nutritional status and the incidence of pulmonary tuberculosis.

Nutrition is one of the important factors that determine the level of human health and welfare, and optimal nutritional levels will be achieved if optimal nutritional needs are met (Arisman, 2009). Malnutrition affects a person's immune system so that it is susceptible to infectious diseases, including tuberculosis (Almatsier, 2006). Poor nutritional status increases the risk of tuberculosis, while tuberculosis (TB) contributes to poor nutritional status as the disease progresses that affects the immune system. Patients with pulmonary tuberculosis often have poor nutritional status (Reichman, 2007) and can even suffer from malnutrition if they do not have a balanced diet. Some of the factors related to the nutritional status of tuberculosis patients are the level of energy and protein adequacy, the patient's diet and health behavior, the length of time they have been suffering from tuberculosis, and the average per capita income of the patient (Putri, 2016; Gupta KB).

The analysis conducted by the researchers showed a correlation between the occurrence of tuberculosis and nutritional status. The results of the study showed that those with a poor nutritional status were more likely to develop pulmonary TB than those with normal nutritional status. In this condition, the body's immune response weakens, causing a reduced ability to maintain resistance to infection. The results of the study also showed that tuberculosis patients also had normal nutritional status, this was due to the knowledge and attitude of respondents who already knew the signs and symptoms of pulmonary tuberculosis whether coughing for more than 2 weeks, fever, decreased appetite, difficulty breathing. Therefore, respondents are aware and have a positive attitude so that they are immediately examined and treated for tuberculosis by health workers before experiencing severe weight loss.

The results of this study also revealed that although some participants had normal nutritional status, they were exposed to tuberculosis bacteria. This does not rule out the possibility of being affected by additional variables, such as gender, environment, and socioeconomic status, which can affect the incidence of pulmonary tuberculosis. Based on the results of the above research, some people have good nutritional status but still suffer from tuberculosis. This may be due to other influencing factors, such as environmental factors, that affect a person's high chance of contracting pulmonary tuberculosis. The incidence rate of pulmonary tuberculosis is greatly influenced by this condition; Small or dense housing and inadequate ventilation are two of the main causative factors that affect the ability of TB bacteria to spread. The results of this study also revealed that although some respondents did not suffer from tuberculosis, their nutritional condition was normal. This is influenced by the living conditions of the respondents, such as living in a house that has enough ventilation so that sunlight can enter. It is widely known that tuberculosis microbes are killed when exposed to direct sunlight. Therefore, if a person has inadequate nutrition but his living conditions are adequate and according to standards, then he will be protected from external germs.

### **The Relationship of Parental Income to the Incidence of Pulmonary Tuberculosis in the Working Area of the Manduamas Health Center**

The results of the research tested with Chi Square Obtained Scores  $p$ -value = 0.271 ( $p$ -value > 0.05) which means that there is no relationship between the income of parents of toddlers and the incidence of pulmonary tuberculosis in the work area of the Manduamas Health Center. Of the 17 parents of toddlers who suffer from pulmonary TB, 13 people have an income  $\leq$  Rp. 2,834,000 and 4 people with low incomes, namely > Rp.2.834.000.

One of the risk factors for the occurrence of pulmonary TB in children is the low income level or poverty of the parents. The financial situation of parents has a direct impact on their income levels, which in turn contributes to the spread of tuberculosis indirectly. This is due to the fact that living in poverty makes it difficult for people to achieve their basic needs for health services and a decent lifestyle. Low socioeconomic status will make it difficult for parents to meet their children's daily food needs and will also reduce the provision of BCG vaccines to their children, which can prevent tuberculosis. Low-income communities often struggle to access adequate health

services and do not think much about their quality of life. because of their busyness and emphasis on making money to cover daily expenses (Priyadi S, 2003).

Research conducted in Magelang by Apriliasari et al. showed that the income level had an OR = 3.188 which means that children with low-income parents had a 3.2 times higher risk of developing tuberculosis than children with high-income parents. Based on the research of Rakhmawati et al., children with low family economic conditions have a higher chance of contracting pulmonary tuberculosis by 7.65 times compared to children with high family economic conditions ( $p=0.001$ ). This shows that pulmonary TB in children is statistically correlated with household economic conditions. Parents with low economic status may find it difficult to meet their children's nutritional needs, increasing the risk of tuberculosis in children.

Based on the results of statistical tests in this study, parental income is not one of the risk factors that cause TB in children, even with income  $\leq$  Rp. 2,834,000 is not one of the factors causing pulmonary TB in toddlers. . According to the researcher's assumption, the factors that affect the occurrence of Pulmonary TB in the Manduamas Health Center work area are family history and environmental factors.

## CONCLUSION

The study sample was 34 people, of which 17 people were proven to have pulmonary tuberculosis (TB) and 17 people were unproven (Control). From the case group, 14 people (82.35%), 4-6 years 3 people (17.64%) were obtained with the age category 1-3 years. In the control group, 1-3 years old were 16 people (94.11%), 4-6 years old and 1 person (5.88%). From the case group, the number of samples was obtained with female gender 6 people (37.5%), male 11 people (64.7%). From the control group, the number of samples was obtained with female gender 7 people (43.75%), male 10 people (58.82%).

The income level of parents of toddlers who were confirmed to have Tb was obtained by 4 people (23.5%) with a parental income of  $>$  Rp. 2,834,000 and 13 people (76.4%) with an income of  $\leq$  Rp. 2,834,000. The income level of parents of toddlers who were not confirmed TB, 7 people (41.17%) with a parental income of  $>$  Rp. 2,834,000 and 10 people (58.82%) with an income of  $\leq$  Rp. 2,834,000. Of the individuals in the case group, 6 people (3.75%) had normal nutritional status and 11 people (64.7%) had stunted nutritional status. In the control group, twelve (70.5%) and five (29.5%) had short and normal nutritional status, respectively.

The risk of pulmonary tuberculosis (TB) in toddlers with stunted nutritional status is 4.4 times greater than in toddlers with normal nutritional status. This is because there is a relationship between the incidence of pulmonary tuberculosis (TB) in the work area of the Manduamas Health Center and nutritional status based on TB/U (normal and stunting), with a p-value of less than 0.05, which is 0.039 with OR. of 4.4.

The amount of exposure to the income level of parents to the incidence of Pulmonary Tb is 2.2 which means that the income of parents of toddlers  $\leq$  Rp. 2,834,000 has a risk of 2.2 times the risk of developing Pulmonary Tb compared to the income of parents of toddlers with  $>$  of Rp. 2,834,000.

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