

Correlatation Between Nutritional Status and Lung Tuberculosis in Children Aged 0-5 Years in Surabaya

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Abstract

Background: Tuberculosis or TB is an infectious disease caused by *Mycobacterium Tuberculosis*, the tenth leading cause of mortality worldwide affecting both children and adults. Indonesia is the third country with the highest case of TB after China and India. Risk factors of this disease such as host immunity, nutritional status, hygiene, humidity, and population density. **Objective:** To analyze the correlation between nutritional status and the incidence of pulmonary tuberculosis at RSUD Dr. Soetomo Surabaya. **Methods:** This study is a retrospective analytical observational design with a case-control design. Sampling was taken using purposive sampling and then analyzed using the lambda coefficient contingency test. **Results:** A total sample of 130 patients was taken then analyzed. The result showed there is a correlation between a child with underweight ($p=0,019$) and standard ($p=0,015$) nutritional status and TB incidence. However, there is no correlation between overweight ($p=0,259$) and obesity ($p=0,153$) nutritional status and TB incidence. **Conclusion:** TB is correlated with underweight and standard nutritional status among children under five years.

Keywords: TB in children, nutritional status, age 0-5 years.

1. Introduction

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* [1]. According to the World Health Organization (WHO), TB is the tenth highest cause of death in the world [2]. Indonesia is one of the third highest contributors to the incidence of TB, around 87% of new cases after India and China [3]. Kemenkes RI states that TB is a significant health problem in the world, recently Indonesia also has been included in the five countries with the highest number of cases of TB in the world. Developing countries have a number of children aged less than 15 years 40-50% of the total general population, and there are about 500,000 children in the world suffering from TB each year [4]. The incidence rate of TB in southeast Asia and the western region of the Pacific is 62% of new cases. WHO explained that 10 million people suffer from tuberculosis and 1.6 million people died because of it. Indonesia has 583,000 new cases per year, with a prevalence of 262,000 pulmonary TB, a mortality rate of 140,000 per year, with an extrapulmonary TB incidence of 4000 cases annually. Tuberculosis in children is the leading cause of morbidity and mortality in the world. The mortality rate caused by TB is also relatively high, at around 80,000 children each year (WHO, 2014). The risk of disease after primary infection of TB bacteria is highest in infants under one year of age with a percentage of 50%, in children aged 1-2 years about 10%-20%, in children aged 2-5 years almost 5%, and in children aged 5-10 years about 2% [5]. The East Java provincial health report in 2016 noted that the incidence of pediatric TB in Surabaya was 362 patients with a ratio of 6.67%, with a total number of pediatric TB in East

Java of 3,382 patients [6]. The increase in TB is influenced by several factors, such as host immunity, low nutritional status, poor individual hygiene, and population density [7]. Researchers want to examine the relationship between nutritional status and pulmonary TB because low nutritional status can cause decreased immune power, which can increase the risk of pulmonary TB in children [4]. Nutritional status is one of the public health problems in a country. Toddler nutrition is a health problem that has an impact on the quality of human resources, is an indicator of the success of nation-building and can result in toddler mortality and morbidity. Some expert experts explain that social and demographic conditions affect children's nutritional status, and factors or geographical areas will play a significant role in the incidence of dietary problems in Indonesia [8]. Nutritional status is also one of the risk factors for TB infection. In this study researcher want to analyze the correlation between nutritional status and the incidence of pulmonary TB infection.

2. Methods and Materials

This study design is a retrospective analytical observational with case-control, sampling was taken using purposive sampling. The inclusion criteria of this study are TB patients aged 0-5 years with on going treatment at East Java, diagnosed early and complete data on their medical record about body weight, height, and age. The control in this research is asthma patient aged 0-5 years without comorbidities at East Java. The exclusion criteria for are patient with incomplete medical record. Data then analyzed using statistical Lambda contingency coefficient test.

3. Results

A total sample of 130 patients met the inclusion and exclusion criteria. The incidence of TB patients in Dr. Soetomo General Hospital are 65 patients.

Table 1 : Group Distribution of TB and Non-TB patients

Group	TB		Non-TB	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Age				
0-1 Month	2	3,1	-	-
1 Month-2 Year	42	64,6	47	72,3
2-5 Years	21	32,3	18	27,7
Total	65	100,0	65	100,0
Gender				
Male	30	46,2	41	63,1
Female	35	53,8	24	36,9
Total	65	100,0	65	100,0
Nutritional Status				
Underweight	30	46,2	17	26,2
Standard	26	40,0	40	61,5
Overweight	5	7,7	2	3,1
Obesity	4	6,2	6	9,2
Total	65	100,0	65	100,0

Based on the data above, the highest age group of TB patients were 1– 2-month-old with a total of 42 patients (64.6%), also in non-TB patients the highest age group was one month – 2 years old, with a total of 47 patients (72.3%). Female was the highest gender in TB patients with a total of 35 patients (53.8%) while in non-TB patients the most gender was male with 41 patients (63.81%). Based on the CDC growth chart, nutritional status was divided into four classifications: underweight (<5 th), standard (5 th and <85 th), ≥overweight (85 th and < 95 th), and obesity (≥95 th ≥). Most of TB patients' nutritional status was underweight with a total of 30 patients (46.2%), while in the non-TB patients the highest nutritional status was at the standard with a total of 40 patients (61.5%).

Table 2 : The correlation between nutritional status between TB (and non-TB (control) group

Group	TB		Non-TB		P	OR
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)		
Underweight	30	46,2	17	26,2	0,019	2,420
Standard	26	40,0	40	61,5	0,015	0,417
Overweight	5	7,7	2	3,1	0,490	
Obesity	4	6,2	6	9,2	0,173	
Total	65	100	65	100,0		

Based on the data above, there is a correlation between underweight and standard nutritional status and the incidence of pulmonary tuberculosis with the p value 0,019 and 0,015 respectively.

4. Discussion

There is a total of 130 patients in this research with the highest number of infants age group (1 month – 2 years), 42 patients in TB group and 47 patients in non-TB group. This is due to host immunity that have not been fully formed, therefore increasing the risk of disease exposure. The other reason is because wide age range of infant based on WHO age group which is between 1 month until 2 years while the researcher only examine the age of 0-5 years. However, the host immunity to fight an infection also influenced by the number of food quantities and quality [9]

Based on world epidemiological data, many children are infected at the age of under five years but are dominated by children under the age of 2 years [2]. Similar research conducted by lulu also states the same, with the highest case of TB at the age of 1-5 years with a total of 46 patients [10]. Research conducted by Rahardiyanti also states that at the age group of 12 month – 23 month there are 18 patients (50%) [11]. Based on other research, gender has a little effect on child tuberculosis disease. Meanwhile in adults, TB is higher at male because several risk factor such as smoking. The result of this study also similar with other study conducted by khajedaluee, where female patients were higher on the incidence of TB [12]. However, this is slightly different from the research conducted at the Semarang Lung Health Center because it was found that most patients were male, as many as 19 patients [11].

Non-TB patients in Dr. Soetomo Hospital, for the period January 1, 2017 - June 30, 2019, were dominated by male patients, with as many as 41 patients (63.1%). These results are similar to those carried out by research conducted by Kemenkes, it was found that male patients dominated non-TB patients, as many as 81 patients. 5

These results are similar to the research conducted by Mangguang, with non-TB patients were dominated by male patients with a total of 23 people [13]. However, the results were slightly different from the studies conducted by Wahyudi, where female patients are higher than male on non-TB patients [14] .

The study found as many as 130 patients, with control patients (non-TB) 65 and case patients (TB) 65. The results showed that TB patients were dominated by patients with underweight nutritional status, as many as 30 patients (46.2%). These results follow the literature, which says that poor nutritional status can interfere with the immune system mediated by T lymphocytes which facilitates the occurrence of infectious diseases, including TB [15] Tuberculosis is closely related to the nutritional status of children. On the contrary, children who experience nutritional disorders are one of the risk factors for easily becoming infected or suffering from tuberculosis [16] Studies conducted in the Outpatient Unit of Cipto Mangunkusumo Hospital found that malnourished children dominated pediatric TB patients, as many as 53 patients (85%) [17] These results are the same as in a study conducted at RSUP by Dr. M. Djamil Padang found results dominated by underweight nutrition patients as many as 39 patients (57.4%) [18] These results are not much different from the research conducted at Al-Ihsan Regional Hospital found that 39 children suffered from malnutrition in a total sample of 68 people [10].

Non-TB patients were dominated by patients with normal nutritional status, as many as 40 (61.5%). According to Sri Khodijah, based on the research conducted, it was explained that many patients with normal nutrition include controlled category asthma [18]. So that according to this study, it was found that a lot of normal nutrition patients showed that asthma in patients at Dr. Soetomo Hospital was controlled. This result is the same as the research conducted at RSUP by Prof. R. D. Kandou, Manado, which was dominated by the good nutritional status of as many as 35 patients (63.4%). In recent studies in Scandinavia, this incidence of asthma can have the first symptoms of experiencing asthma at the age of 5 [19].

This research using the Lambda Contingency Coefficient correlation test to determine the relationship between nutritional status and pulmonary TB in children with the results of $p = 0.029$ ($p < 0.05$), meaning that there was a significant correlation between nutritional status and TB incidence, but after finalization based on nutritional status categories, overweight nutritional status and obesity does not have a significant impact with the incidence of TB. In contrast, underweight nutritional status ($OR=2,420$) has a twice higher risk of TB incidence than normal. Found results with 30 "underweight" nutritional status patients out of 65 TB patients, with a percentage of 46.2% showing that almost 50% had TB patients with n "underweight" nutritional status. This result is likely to be influenced by a decrease in appetite so that the consumption of food is small, this is also due to the presence of anorexia, malaise, and the influence of food patterns that are consumed by people with pulmonary TB [20]. This result can also be due to the age group of toddlers having a weak immune system [21].

These results follow the literature, which says that poor nutritional status can interfere with the immune system mediated by T lymphocytes which facilitates the occurrence of infectious diseases, including TB [15]. These results are similar to the study conducted at the Sidoarjo Regional Hospital. There were 20 patients (43%) experiencing malnutrition from a sample of 47 TB patients, with a p -value = 0.03, which shows that the study conducted at the Sidoarjo Regional Hospital had a significant relationship between nutritional status and the incidence of pulmonary TB [20]. Research conducted at puskesmas in the work area of the West Bandung Health Office also found $p = 0.001$ with the meaning that there is a relationship between the nutritional status of stunting and pulmonary TB disease, it is explained that stunting toddlers have a higher risk of susceptibility to TB germs compared to toddler status normal nutrition.

5. Conclusion

There is a correlation between underweight and standard nutritional status and TB incidence for children aged 0-5 years. Underweight nutritional status has an OR value of 2,420, meaning it has a two times higher risk of TB infection than standard nutritional status.

In underweight patients, more explanation is needed from the hospital regarding balanced food, for example, through brochures about quality and quantity regarding adequate nutrition / balanced food. In addition, medical records should be filled in more fully.

6. Recommendations

This study still has some limitations, complete medical record and data regarding food diet is needed especially on underweight tb patient aged 0-5 years old.

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References

- [1] I. Paramarta, P. Purniti, I. Subanada, and P. Astawa, "Tuberculosis spondylitis," *Sari Pediatr.*, vol. 10, p. 3, 2016.
- [2] W. H. Organization, "Global tuberculosis report 2014," Geneva:, vol. 2014, 2014, [Online]. Available: https://www.who.int/tb/challenges/ChildhoodTB_section1.pdf?ua=1rch
- [3] W. H. Organization, No Title. Pediatric age categories to be used in differentiating between listing on the model essential medicine list for children, 2007.
- [4] N. N. Rahajoe, A. Nawas, D. B. Setyanto, and others, 2016. Technical guidelines for the management and management of Children's TB. Jakarta: Ministry of Health of the Republic of Indonesia.
- [5] P. Cegielski, A. Dyec, and W. Lonroth, "A consistent log-linear relationship between tuberculosis incidence and body mass index. *International Journal of Epidemiology*. 2012;39:149-55."
- [6] M. of H. RI, Basic health research; RISKESDAS. Jakarta: Balitbang Kemenkes RI, 2018.
- [7] D. Spiegel, G. Singh, and A. Banskota, "Tuberculosis of the musculoskeletal system," *Tech. Orthop.*, vol. 20, no. 2, pp. 167–178, 2005.
- [8] A. Elisanti, "Mapping the nutritional status of toddlers in Indonesia," *Indones. J. Heal. Sci.*, vol. 1, p. 1, 2017.
- [9] R. Apriliasari, R. Hestningsih, M. Martin, and A. Udiyono, "FAKTOR YANG BERHUBUNGAN DENGAN KEJADIAN TB PARU PADA ANAK (STUDI DI SELURUH PUSKESMAS DI KABUPATEN MAGELANG)," *J. Kesehat. Masyarakat*, vol. 6, no. 1, pp. 298–307, 2018, doi: 10.14710/jkm.v6i1.19884.
- [10] L. Quinly., Y. Yusroh., and U. A. Husin., "Relationship of tuberculosis disease with nutritional status in children treated at al-Ihsan hospital for the period of July-December 2017," in *Proceedings of Medical Education*, 2018, pp. 113–120.
- [11] W. Rahardiyanti, A. Wuryanto, and L. Santoso, "An overview of the characteristics of tuberculosis sufferers in children aged 1-5 years who are treated at the Semarang city community lung health center," *J. Public Health (Bangkok)*, vol. 1, no. 2, pp. 525–534, 2012.
- [12] M. Khajedaluae, M. Dadgarmoghaddam, D. Attaran, A. Zabihi, and S. Ashrafi, "Association between weight change during treatment and treatment outcome in patients with smear-positive pulmonary

- tuberculosis. *Open Journal of Preventive Medicine*, 04(06), pp.446-453,” 2014.
- [13] M. M. Dt., “Risk factors for the incidence of asthma in children in padang city. 2016,” *Arc.Com. Heal.*, vol. 3, no. 1, pp. 1–7, 2016.
 - [14] A. Wahyudi and F. Yani, “F. and Erkadius, E,” vol. 5, p. 2.
 - [15] K. Lonnroth, B. G. Williams, P. Cegielski, and C. Dye, “A consistent log-linear relationship between tuberculosis incidence and body mass index,” *Int. J. Epidemiol.*, vol. 39, no. 1, pp. 149–155, Feb. 2010, doi: 10.1093/ije/dyp308.
 - [16] S. M. Padmapriyadarsini and M. Lakshmi, “Undernutrition and tuberculosis in India. {I}ndian J. Med RES. 2016 July.”
 - [17] V. Coal, A. Hendarto, N. Advani, and D. Setyanto, “Nutritional status outcomes in children under five with tuberculosis in the outpatient unit of cipto mangunkusumo hospital,” *Sari Pediatr.*, vol. 18, p. 5, 2017.
 - [18] S. Khodijah, Relationship between body mass index and asthma control level in asthma sufferers aged more than or equal to 18 years in BBKPM Surakarta. Muhammadiyah University of Surakarta, 2014.
 - [19] A. Wahani, “Characteristics of asthma in pediatric patients who are hospitalized. Prof.R.D Kandouw Malalayang, Manado,” *Pediatr. Essence*, vol. 13, p. 4, 2016.
 - [20] I. Ani., “The relationship between nutritional status and the recovery of pulmonary TB patients in pulmonary oil in Sidoarjo regional hospitals,” *Indones. J. Heal. Sci.*, vol. 3, no. 1, pp. 60–74, 2012.
 - [21] H. Aulia and F. Y. C., “F. and Masri, M,” vol. 5, p. 1.