Correlation Between Tuberculosis And Nutritional Status Among Children In North Lombok, West Nusa Tenggara, Indonesia

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Abstract. Tuberculosis (TB) and malnutrition are the main causes of morbidity and mortality among children in developing countries. Tuberculosis become worse if there are present of malnutrition. In contrary, malnutrition can be caused by chronic inflammatory disease such as TB. This study aimed to analyze the correlation between tuberculosis and nutritional status among children in North Lombok, West Nusa Tenggara, Indonesia. This cross sectional study recruited child TB aged under 18 years as participants. TB was diagnosed by TB scoring in Children, Tuberculin Test, Fine Needle Aspiration Biopsy (FNAB) and Thorax Photos, and nutritional status was assessed using Center for Disease Control and Prevention (CDC) chart. Total 130 children were identified, 65 children with TB and 65 healthy children as control. This study showed that pulmonary TB was present in 72.3% of case, Lymphadenitis TB was 16%, and mixed pulmonary and lymphadenitis TB were 2%. Under-nutrition child was found in 63.1% of cases, malnutrition child was found in 29.2% of cases. There was significant correlation between tuberculosis and malnutrition among children ($p<0.05$). The highest proportion of TB was in children under five years (52.3%). TB is strongly correlated with malnutrition among children.
Keyword : Corre;ation, Children.

1 Introduction

Tuberculosis (TB) and malnutrition are the main causes of child morbidity and mortality in developing countries. In 2015, around 1 million children suffered from TB and 170,000 of them died.[1] According to WHO's Global Tuberculosis Report (2016), Indonesia is the country with the second largest number of new cases in the world after India. The number of TB cases in the age group 0-14 years increased by 0.45% in 2016.[1] North Lombok was in the first position with the highest number of cases of TB in children, 37 cases or 14% of the total number of TB children in North Lombok. Malnutrition according to the index weight for height is still a problem in North Lombok. In 2016, North Lombok Regency was the 3rd largest in West Nusa Tenggara with the number of children with poor nutrition and under nutrition [2],[3]. According to the World Health Organization (WHO), malnutrition increases the risk factors for pulmonary TB in children [1], children with malnutrition have a high risk factor with the occurrence of respiratory infections, one of them is tuberculosis.[3]

2 Method

2.1 Data Collection

This cross sectional study was conducted in North Lombok District Hospital in February - May 2018. The sample in this study were children under the age of 18 years old were diagnosed with tuberculosis (TB) in both pulmonary tuberculosis, lymphadenitis tuberculosis and mixed at North Lombok hospital. Control population using healthy children in Elementary School and Junior high schools North Lombok aged 0-15 years toke by simple random sampling. The sample size in this study was 65 children diagnosed with TB and 65 healthy children.

Data collection was carried out from patients who were treated at the Children's Polyclinic and Emergency unit at the north lombok General Hospital and direct measurements of body weight and height in Elementary and Junior High School in the North Lombok from February to May 2018. Diagnosis of TB based on TB scoring in Children, Tuberculin Test, Fine Needle Aspiration Biopsy (FNAB) and Thorax Photos by pediatricians at North Lombok General Hospital. Assessment of nutritional status based on body weight compared to height was assessed using the WHO table for children aged under 5 years while those for children over 5 years old used the CDC 2000 chart.

2.2 Statistical Analysis

The data were processed statistically using Chi-Square Test and ANOVA test to determine the effect of malnutrition, gender and age in children with the incidence of TB in children taking into account significant values $p < 0.05$ and OR (risk size) in the cross tabulation table for Chi-Square analysis. Confident Interval (CI) 95% is used to see the significance of OR on the age variable.

3 Results And Discussion

The result showed most children with TB at the age of under 5 years were 34 children (54.3%) of 65 children. Distribution of TB cases based on male sex was more frequent than girls with 34 children (56.9%) while women number 28 children (43.1%). The distribution of nutritional status in the most TB children has a poor nutritional status as many as 41 children (63.1%), malnutrition as many as 19 children (29.2%) and good nutrition as many as 5 children (7.7%). While the nutritional status of healthy children as many as 51 children (78.5%) had good nutrition and overweight as many as 14 children (21.5%). In table 2, it was found from 65 pediatric TB patients, 47 children (72.3%) diagnosed with pulmonary tuberculosis, 16 lymphadenitis TB (24.6%) and pediatric mixed diagnosed with pulmonary TB and lymphadenitis TB in 2 children (3.1 %).

Table 1. The Characteristic of Tb Child and Normal Child

	TB child		**Normal Chlid**	
	Number (n)	**Percentage (%)**	**Number (n)**	**Percentage (%)**
Age				
0 – 5 years	34	52.3	27	41.5
6 – 10 years	19	29.2	28	43.1
11-15 years	10	15.4	10	15.4

	TB child		Normal Chlid	
	Number (n)	**Percentage (%)**	**Number (n)**	**Percentage (%)**
>15 years	2	3.1	-	-
Gender				
Male	37	56.9	27	41.5
Female	28	43.1	28	43.1
Nutritional State				
Normal	5	7.7	51	78.5
Overweight	-	-	14	21.5
Underweight	41	63.1		
Malnutrition	19	29.2		
Type of TB				
Pulmonary TB	47	72.3		
Lymphadenitis TB	16	24.6		
Mixed	2	3.1		

Table 2. Crosstabulation association of type of TB with nutritional state

Nutritional state	Type of TB		P
	Pulmonary TB (n)	**Lymphadenitis TB (n)**	
Normal	1	4	
Overnourished	0	0	0.00
Undernourished	28	13	
Malnutrition	18	1	

The results of correlation tests, it was found that there was a significant correlation between malnutrition and TB cases in children with p-value 0,000 ($p < 0.05$) and there was no corrrelation between age and incidence of TB cases in children with p-value 0.292 ($p > 0.05$). There was also no correlation between sex with TB cases in children with p-value 0.66 ($p > 0.05$). So it can be concluded that both boys and girls have the same risk of developing TB.

Most TB were suffered by children under 5 years (52.3%), this result was the same as previous studies conducted by Munthali et al (2017), namely the highest population age was under 5 years [3]. The highest sex was male, similar to the results of his research. The nutritional status of subjects suffering from TB was mostly underweight (63%) and malnutrition (29.2%). Primary pulmonary TB was still the most type of the TB (72.3%) similar to previous studies by Munthali [3]. Children with severe protein–energy malnutrition were at a higher risk for developing tuberculosis [4]. A study of children with pneumonia in The Gambia suggests that M. tuberculosis was not an uncommon cause of pneumonia, especially among malnourished children [3]. In Bulawayo, Zimbabwe, an autopsy series of 184 children under 5 years of age who died at home showed that tuberculosis was present in 4%, and all of the children who died with tuberculosis had marasmus [5]. However, it is difficult to disentangle this process in vivo, for once the child has active disease, the resulting inflammatory and immune response increases metabolic rate, affects synthetic pathways (a so-called anabolic block), and impacts absorption, distribution, and excretion of nutrients, which altogether promotes malnutrition.[6],[7] This was supported with evidence that showed tuberculosis therapy significantly improved anthropometric status and micronutrient levels.[8] Thus, although cross-sectional studies demonstrate nutritional deficiencies in malnourished children with tuberculosis[9], they have a limited role in describing the mechanisms underlying this relationship. Instead, it is more useful to evaluate how the malnourished child

develops an immune response against tuberculosis soon after infection, and how any possible dysfunction may promote progression to active disease.[10]

4 Conclusions

From this study it can be concluded that tuberculosis strongly correlated with nutritional status on children those malnutrition could affected the incidence of tuberculosis on children. But the mechanism of how malnutrition could affected the incidence of tuberculosis remains unclear. Therefore we suggested that further prospective studies should be conducted to find the mechanism of TB effected malnutrition in children.

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