Effectiveness Diagnosis of Pulmonary Tuberculosis (TB) in Children Based on Clinical Symptoms

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ABSTRACT

Background: Diagnosis of pulmonary tuberculosis (TB) in children is still a challenge because the gold standard by examining sputum AFB is difficult. This study aimed to see the effectiveness of diagnosing TB in children based on clinical symptoms. **Methods:** This study is a retrospective study with a case-control design, and consecutive sampling from the medical records of pediatric TB patients at Panembahan Senopati Hospital, Bantul for the period January 2014 - December 2016. The total population is 90, and the sample is 73. Children diagnosed with a score (score 6) are in the control group (n=30), while children with a diagnosis score of <6 were diagnosed with pulmonary TB based on clinical symptoms, we categorized them into the case group (n=43). **Results:** There was no difference in gender, age, and group domicile. However, there was no significant difference in nutritional status (malnutrition), long cough, and chest X-ray. The difference between the two groups was found in symptoms of fever and enlarged lymph nodes. Also, it was found in TB contacts and the Mantoux test but this could be a recall bias because in the diagnosis group this is rarely done. The sequential scoring parameters from the most common were chest X-ray, malnutrition, cough, enlargement of lymph nodes, fever, contact TB, and the Mantoux test. Improvement of symptoms (cough, fever, lymph nodes, and chest X-ray) after 6 months of therapy occurred 100% in both groups. **Conclusion:** The diagnosis of TB in children based on clinical symptoms can be used as an effective alternative**.**

1. Introduction

The World Health Organization (WHO) 2017 estimated that the incidence of pulmonary tuberculosis (TB) in Indonesia was 842,000 or 319 per 100,000 population with notification cases of 569,899 cases, meaning that 32% had not been reached, had not been detected, or were not reported. The success of treatment based on data on the situation of Indonesian TB until May 2019 was 85%. These two things illustrate the risk of transmission in the environment and one of the vulnerable groups is children, as an illustration of 60,676 cases of child TB in Indonesia.[1] In 2017, of the 10 million TB cases in the world, 1 million of them were TB cases in children

(0-14 years), around 7.5 million children were infected with TB every year, or> 1 million new TB cases in children every year.

Furthermore, TB cases in Yogyakarta in 2017 were based on place of treatment (not based on domicile), counted as 3,514 cases with the order of most cases handled in Yogyakarta City 948 cases, Sleman 883 cases, Bantul 854 cases, Gunungkidul 510 cases, and Kulonprogo 391 cases.[3] Among the five districts/cities in DIY that have the lowest percentage of hospitals with DOTS is Bantul, which are 9 hospitals with DOTS services out of 16 hospitals (56%).[4] The data from the Bantul Health Office in 2017 stated that the TB cure

rate was 72.44% of 516 cases with 209 cases of AFB positive.[5] The difference in the number of TB cases in Bantul is estimated because the Yogyakarta Respira Pulmonary Hospital is located in Bantul.

Based on that condition, TB in children is considered not contagious so it is not a priority for TB treatment. It is estimated that many children suffer from TB who do not get treatment because of the inadequate system of recording and reporting TB cases in children due to the absence of a "child-friendly" diagnostic tool and atypical clinical symptoms. As a solution to this problem, the Indonesian Ministry of Health and IDAI (Indonesian Pediatrician Association) compiled a scoring system for a diagnostic tool for child TB.[2] One of the parameters in the scoring is a positive tuberculin test which takes at least 3 days to wait for the results. Due to the long waiting time, and the availability of tuberculin tests, the strong clinical symptoms are often the reasons for the diagnosis of TB infection in children. The symptoms are fever, cough, exhaustion, and the change of body weight.[12]

Therefore, based on explanation above, this study has aims to discuss about the effectiveness of diagnosing TB in children based on clinical symptoms, especially the cases in Bantul.

2. Methods

This study was a retrospective study with a case control design. The population was taken from medical records of cases of paediatric TB patients at Panembahan Senopati Hospital, Bantul, for the period since January 2014 until December 2016. By using consecutive sampling as the sampling method, the sample was all pulmonary TB patients aged 1-14 years in that period. There were 90 data on children with pulmonary TB, 73 of which were included in the inclusion criteria. There were completed 6 months of OAT therapy and each visit was recorded as complete. Exclusion criteria when accompanied by other diseases, DO therapy. Children who were established pulmonary TB using scoring diagnosis (score ≥6) are the control group, while children who received OAT therapy but the diagnosis score was less than 6 it

means that the children were diagnosed with pulmonary TB base on clinical symptoms, we categorize into case groups.

Data analysis was carried out in stages including univariate and bivariate analysis. Univariate analysis was used to see the normality of the distribution and data characteristics of each variable while bivariate analysis was used to determine the significant differences between each variable in the two groups. Variable 'weight gain', using crosstabulation analysis, Shapiro-Wilk test and independent T-test. While the variables 'improvement of cough', 'improvement of fever', 'improvement of enlarged lymph nodes' and 'improvement of chest X-ray' were tested using crosstabulation analysis and Chi-square test.

3. Results

The result data from medical record patients at Panembahan Senopati Hospital Bantul since January 2014 until December 2016 showed children who were established pulmonary TB using a scoring diagnosis (score ≥6) were 30, while the diagnosis scoring <6 was 43 in this study we called children were diagnosed pulmonary TB base on clinical symptoms.

The sample characteristics at the first month of treatment on both groups were presented that the characteristics of gender, age, and domicile were not directly included in the TB scoring (Table 1), so no further analysis was carried out. Moreover, the results (p-value) for those characteristics of the two groups were not significantly different, this illustrates the equality of the sample.

The characteristic data presented in Table 1 is the 1st month of the sample being treated, then an analysis is carried out by comparing it with the results of the condition at the 6th month in both groups. The results of the analysis are as follows:

First, nutritional status of a sample of TB children showed malnutrition is the initial finding at diagnosis of upright TB (Table 2). Second, the 100% improvement of cough symptoms on the end of treatment (6th month) seen in both of group (Table 3). Third, in both groups, the fever and lymph nodes

enlargement, there were a 100% improvement after the 6th month of therapy (Table 4 and 5). This shows that the child's immunity returns when the TB infection stops and is declared cured.

Table 1. Sample characteristic

Characteristics		Scoring Diagnostic (n=30)	Clinical Diagnostic (n=43)	p-value
Gender	Female	17 (56.7%)	22 (51%)	0.643
	Male	13 (43.3%)	21 (49%)	
Average of age (years)		3.1 (2.1%)	4.16 (3.2%)	0.218
Domicile	Bantul	29 (97%)	41 (96%)	
	Kulonprogo	0 (0%)	1 (2%)	0.794
	Gunung Kidul	1 (3%)	1 (2%)	
Nutritional Status		27 (90%)	36 (84%)	0.510
Cough		28 (93%)	33 (77%)	0.106
Fever		19 (63%)	4 (9%)	0.011
Limph node enlargement		25 (83%)	13 (30%)	0.000
Thorax radiology		30 (100%)	43 (100%)	
TB contact		13 (43.3%)	0 (0%)	0.000
Mantoux test		4 (13.3%)	0 (0%)	0.025

Table 2. Nutritional status analysis

	Scoring diagnostic (n=30)	Clinical diagnostic (n=43)	p-value
Malnutrition (1st month)	27 (90%)	36 (84%)	0.510
Weight gain (6th month)	30 (100%)	43 (100%)	
Average of weight gain	2.3 (1.36%)	2.23 (1.18%)	0.986

Table 3. Cough analysis

	Scoring diagnostic (n=30)	Clinical diagnostic (n=43)	p-value
Cough (1st month)	28 (93%)	33 (77%)	0.106
Cough (6th month)	00 (0%)	0 (0%)	
Cough improvement	30 (100%)	43 (100%)	

Table 4. Fever analysis

	Scoring diagnostic (n=30)	Clinical diagnostic (n=43)	p-value
Fever (1st month)	19 (63%)	4 (9%)	0.011
Fever (6th month)	0 (0%)	0 (0%)	
Fever improvement	30 (100%)	43 (100%)	

Table 5. Lymph node enlargement

	Scoring diagnostic (n=30)	Clinical diagnostic (n=43)	p-value
Lymph node enlargement (1st month)	19 (63%)	4 (9%)	0.011
Lymph node enlargement (6th month)	0 (0%)	0 (0%)	
Lymph node enlargement improvement	30 (100%)	43 (100%)	

4. Discussion

Analysis of symptom improvement at the end of the 6th month of TB therapy both two groups (the scoring diagnosis group and a clinical symptom diagnosis) can be used as an effort to describe the effectiveness of the diagnosis by clinical symptoms. The following are some symptoms which used as measurements.

Nutritional status

Supporting factors related to nutritional status in children who infected TB are the level of nutritional adequacy. There is a relationship between nutritional status and susceptibility to suffer from TB. The children who diagnosed TB are commonly have lost weight. The nutrition especially energy, protein, and eating habits and the period of time the children are exposed with TB.[13] Children with malnutrition status had a 3.31 times greater risk of developing TB in children than children with good nutrition.[8]

Table 2 displays the nutritional status analysis, based on the description of changes in body weight (BW) of the two groups, showed that all samples had increase in body weight with a mean increase 2.3 kg in the scoring group and 2.23 kg in the clinical diagnosis group. Obtaining this data is in accordance with Septia's (2013) research at Puskesmas Banjarbaru which states that the average increase in body weight for children with TB after being declared cured is 2.3 kg with 12 samples (40%) of respondents experiencing an increase of 3kg.[6] The average weight gain is in accordance with the results of the research conducted.

Moreover, as many as 80 respondents with pulmonary TB in Bandar Lampung who underwent intensive treatment at the health center, 86.3% experienced an increase in body weight and only 13.7% experienced a decrease in weight.[7] These results are different from the results of this study. It is possible because the quarantine of respondents is different, between adults with children, but in principle at the end of treatment and it is declared cured there is an increase in body weight >50% of the sample.

Cough

Although cough is not the main symptom of pulmonary TB in children, it is often the cause of parents taking their children for treatment and eventually being diagnosed with TB. The findings of cough symptoms at the beginning diagnosis of TB in children were not significantly different in the two groups, which 93% in the scoring diagnosis group and 77% in the clinical diagnosis (Table 3), and both showed 100% improvement at the end of therapy.

These results differ from the results of research X which states that chronic cough complaints only occur in 4% of respondents.[9] The most frequent symptom that found in clinic was cough (96%) followed by fever, history of contact.[10]

Fever

There was a significant difference from fever symptoms at the beginning of TB examination in the two groups. Fever is not the main reason parents bring their children to seek treatment for suspected TB. Since it is a symptom of all infections, and fever treatment at home are the reasons children are not immediately taken to health services.[14] The scoring

diagnostic group led parents to remember the symptoms that had ever appeared, one of which was fever (63%), which has a value in the diagnosis of pulmonary TB in children. Only 9% parent in clinical diagnostic group bring their children to seek treatment for suspect TB. Another result about fever in pediatric TB are found 84%.[10]

Lymph nodes enlargement

One of the other symptoms in children with TB is enlarged lymph nodes.[15] It is characterized by painless, spongy, multiple and sometimes attached to each other, most often found in the neck area, and does not respond to antibiotics.[16] The findings the symptom when the first time diagnose were significant in both groups, that is 63% in the scoring diagnostic group and 9% in the clinical diagnosis group. Clinical diagnosis group has a low percentage since it is done by checking for lumps in the lymph nodes or injecting a type of protein which are not always accurate.[17]

Chest x-ray imaging

Chest x-ray imaging is used to check for asymptomatic active disease and to stratify for risk.[18] It is leading to suspicion of TB was carried out 100% in all samples in both groups. At the end of 6 months of therapy, radiological improvement was found in both groups. This result corresponding with another result about chest x-ray was suggestive of TB 78%.[10]

TB contact

The contact characteristics of TB can lead to recall bias because of the lack of knowledge about the history of TB in adults who have close contact with children. Risk factors for TB transmission in children depending on the degree of transmission, duration of exposure, children's body endurance.[19] The source of infection is TB patients with BTA (+) at the time of sneezing or coughing, where the sufferer spread germs into the air phlegm drip or splash.[20] However, about 30-50% children who are in contact with adults with pulmonary TB gave a positive infection result.[21]

Mantoux test

Although the Mantoux test has a high score on TB diagnosis by scoring, but the constraints, not all health services provide, cost constraints, causing pain in children, and waiting time for results are often not done when clinical symptoms have strongly led to a TB diagnosis. Based on domicile, the patient lives in an area with a high prevalence of adult pulmonary TB. This illustrates that the finding of TB cases in children is a direct consequence of the presence of adult TB in the vicinity.[11]

5. Conclusion

Using clinical symptoms as diagnosis for pulmonary TB in children can be used as an effective alternative due to the long waiting time and the availability of tuberculin tests. The sequential scoring parameters from the most common were chest X-ray, malnutrition, cough, enlargement of lymph nodes, fever, contact TB and the Mantoux test. There is no difference in symptom improvement that describes the cure for TB in children with both scoring and clinical symptoms in diagnostic.

6. References

1. Directorate General of Direct Infectious Disease Prevention and Control. TB situation in Indonesia. 2022.
2. Directorate General of Direct Infectious Disease Prevention and Control. Children TB. 2022.
3. DIY Health Service. DIY treats 3,514 TBS cases during. 2017.
4. DIY Health Service. DIY continues to Improve access to TB services. 2022.
5. Bantul DK. Bantul ready for TB elimination. 2022.
6. Septiana A, Budiarti LY, Lestari DR. Overview of weight gain of TB patients in the work areas of the public health center, Guntung Payung and Banjarbaru health center. J Keperawatan Kesehatan. 2013; 1(2).

7. Mandala Z. Relationship between weight gain of pulmonary tb patients who are currently receiving intensive treatment with conversion of AFB examination results in 2012. Jurnal Med Malahayati. 2015; 2(4).

8. Siregar PA, Gurning FP, Eliska, Pratama MY. Analysis of factors associated with pulmonary tuberculosis incidence of children in Sibuhuan general hospital. Jurnal Berkala Epidemiologi. 2018; 6(3): 268.

9. Noviarisa N, Yani FF, Basir D. Trends in children tuberculosis cases at Dr. M. Djamil hospital, Padang 2014-2016. J Kesehatan Andalas. 2019; 8(15).

10. Putra IA, Amelia. Profile of children tuberculosis in outpatient installation of Raden Mattaher General Hospital Jambi. Jambi Med J. 2013; 1(1).

11. Swaminathan S, Rekha B. Pediatric tuberculosis: Global overview and challenges. Clin Infect Dis. 2010; 50.

12. Lusiana D. Literature review: Children's TB scoring system for diagnosis in the control of children's TB. Indo J Infect Dis, 2019; 5(1): 38-45.

13. Dhanny DR, and Sefriantina S. Relationship of energy intake, protein intake, and nutritional status on tuberculosis incidence in children. Muhammadiyah J Nutr. 2021; 2(2): 58-68.

14. Pratama YA. Clinical characteristics of pulmonary tuberculosis in children. J Penelitian Perawat Profesional, 2021; 3(2): 237-242.

15. Alam A, Soekotjo FN, Sudarwati S. Clinical Profile of TB in children at pediatric outpatient clinic Hasan Sadikin hospital Bandung 2016. J Med Health. 2019; 2(3): 818-827.

16. Armika K, Sali SKM, Wayan I, Rusminingsih SKM, and Ketut N. Relationship between occupancy density and transmission of pulmonary tuberculosis household contacts in the Buleleng health center. Doctoral dissertation, Jurusan Kesling. 2020.

17. Trimirasti A. The intricacies of TB lymph nodes that cause swollen neck. SehatQ. 2022.

18. Nachiappan AC, et al. Pulmonary tuberculosis: Role of radiology in diagnosis and management. Radiological Society of North America. 2017; 37(1).

19. Hamdan, Septian D, Wijaya. Children tuberculosis. J Kesehatan Masyarakat. 2021; 1(1): 18-21.

20. Febrian MA. Factors associated with the incidence of children pulmonary TB in the Garuda community health center, Bandung city. J Ilmu Keperawatan. 2015; 2(3): 64-79.

21. Harmani N, Linda O, Sulistiadi W. Host and environmental factors with the incidence of pulmonary tuberculosis in cianjur regency, west java province. Indo J Health Development. 2019; 1(2): 40-47.