Determinant Factors on Active and Latent Tuberculosis among Children in Surabaya

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Abstract

Background: Pediatric tuberculosis (TB) is a major health problem in the world and Indonesia. The difficulty of diagnosis is a major factor in eradicating TB in children. Active and latent tuberculosis in children often shows no symptoms so it is difficult to diagnose and affect the treatment. Several determinant factors need to be assessed with the hope of optimal handling of TB in children. **Objective:** To analyze the determinant factors on active and latent tuberculosis among children in Surabaya. **Methods:** A case control study was done with 25 cases with TB divided into active TB, Latent TB. Pulmonary tuberculosis was diagnosed using the Indonesian Pediatric Tuberculosis Scoring System. Determinant factors for tuberculosis development were history of contact with a TB patient, age, BCG immunization, knowledge, socioeconomic status and overcrowding living condition. Analysis was done using *Fisher's Exact* and *Mann-Whitney* test. **Findings:** The characteristics of the study subjects consisting of 16 active TB children and 9 latent TB children. In the group of active TB children the largest population is girls (11 children), whereas in the latent TB group are boys (8 children). There was a significant difference between groups of active TB children and latent TB children ($p = 0.000 < 0.05$). The other factors are showing nothing different in the both of group TB. **Conclusion:** The most significant determinant factor in active TB and latent TB in children is the appearance infiltrate of chest X-ray where active TB shows filtration and normal appearance in latent TB.

Keywords: *Tuberculosis; children; active; latent; determinant factors.*

Introduction

Tuberculosis (TB) is a chronic infectious disease caused by infection with *Mycobacterium tuberculosis* (M.Tb). This disease is the second leading cause of death in the world due to infection after HIV / AIDS. In Indonesia, pulmonary TB is still one of the main causes of morbidity and mortality in children[1,2]. The highest TB cases were found in the provinces of West Java, East Java and Central Java with the number of cases from the three provinces reaching 38% of all new TB cases in Indonesia[3].

It is estimated that around two billion people suffer from latent TB infection and cause new TB cases in 9.2 million people and deaths in 1.7 million people in the world. About 5-10% of people who suffer from latent TB infection will become active TB in the first five years after becoming infected with TB bacterias. Children with latent TB infection are more likely to develop into a serious disease than adults[4,5].

The diagnosis of paediatric TB is based on history taking, clinical symptoms, physical examination and support. History of contact, especially with active adult TB sufferers accompanied by a collection of clinical symptoms of children suspected of TB including coughing> 3 weeks, weight loss or not rising for no

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apparent reason despite having received adequate nutritional treatment, prolonged or recurring fever for no apparent reason > 2 weeks, anorexia and inactivity. However, children infected with TB often show typical symptoms[6,7]. Chest radiographs to establish a TB diagnosis in children are not typical except in miliary TB. Tuberculin test based on cellular immunity is considered impractical because it requires a minimum of two diagnostic visits. Tuberculin test can be affected by various conditions so that it can produce false positives or false negatives[3,6,7].

The problem of TB in children is caused by several factors, including limited data on active TB and latent TB infection in children and difficulty in establishing a diagnosis that affects the management of TB therapy in children. The definitive diagnosis of TB is made by finding M.Tb on direct smear examination and / or culture which is a gold standard examination. But a definitive diagnosis in children is difficult to obtain because of the small number of bacteria (pausibasiler), the child is difficult to expel sputum, the location of bacterias in the parenchyma area far from the bronchi[3,7,8].

Indonesia has developed a TB scoring system for children and is still being applied to help establish a diagnosis of TB in children. Constraints in the scoring system include parameters used such as tuberculin test and chest X-ray not always available at primary health facilities[3,9,10]. This study aims to analyze the determinant factors that influence TB disease in children infected with *Mycobacterium tuberculosis* so that prevention can be done so as not to become ill with TB.

Method

Observational research with case-control design was conducted at the polyclinic and inpatient at Perak Timur Primary Health Care and the Lung Hospital in Surabaya in the city in October until Desember 2019.

Sample of study were pediatric patients aged 0 - <18 years who suffer from active TB and latent TB who examined themselves at the Perak Timur Primary Health Care and Surabaya Lung Hospital in the period October-Desember 2019. Inclusion criterion includes children aged 0 - <18 years, newly diagnosed pulmonary TB active or latent TB, has a history of contact with adult TB with positive microbiology examination, is willing to be the subject of research, that is stated by signing the consent sheet by the child's parents. Meanwhile, the exclusion factors are children with congenital diseases, children with other chronic illnesses such as diabetes, malignancy, kidney disease, liver disease, blood diseases, allergies, malaria, and immunocompromised diseases such as HIV, children who have received TB treatment, children who are receiving immunosuppression therapy. Calculation of sample size in research uses consecutive sampling based on the number of patients available during the planned study period.

History and physical examination, nutritional status, chest X-ray and lateral position were performed. A positive tuberculin test showed TB infection. The diagnosis of tuberculosis was made by the scoring method. The scoring system for pediatric tuberculosis diagnosis included TB contact, tuberculin testing, nutritional status, fever ≥2 weeks without apparent cause, cough ≥3 weeks, enlarged lymph nodes, swollen joints / bones, chest X-Ray. The TB scoring system based on interviews conducted by researchers includes positive smear contacts and TB symptoms as well as tracking of risk factors using a questionnaire. This study was approved by the Medical Research Ethics Committee of the Faculty of Medicine, Wijaya Kusuma Surabaya University in 2019. Data analysed with *Fisher's Exact* and *Mann-Whitney* with SPSS 20.0 (SPSS.Inc., Chicago, IL). Significant level was reached when $p < 0.05$.

Findings

Table 1 shows the characteristics of the study subjects consisting of 16 active TB children and 9 latent TB children. In the group of active TB children the largest population is girls (11 children), whereas in the latent TB group are boys (8 children). The distribution of maternal education data in the group of active TB children showed that the most mothers with a high school education level were 12 people (75%). In the group of latent TB children, there were 7 mothers with the most recent education graduating from high school (77.8%). Whereas in the type of work most mothers are housewives are 15 people (93.8%) in the active TB children group and there are 9 people (100%) in the latent TB children group.

Likewise in the educational characteristics of most fathers graduating from high school there were 12 people (75%) in the group of active TB children and there were 6 people (66.7%) in the group of latent TB children. Whereas in the most types of father's work was private sector which were 18 people (18%) in the group of active TB children and employees/labourer's/migrant

workers were 6 people (66.7%) in the group of latent TB children.

Table 1. Characteristics of respondents

Characteristic	Group	
	TB Active (n=16)	TB latent (n=9)
	n (%)	n (%)
Gender :		
Boy	5 (31.3)	8 (88.9)
Girl	11 (68.8)	1 (11.1)
Mother's Education :		
Primary	0 (0)	2 (22.2)
Junior	3 (18.8)	0 (0)
Senior	12 (75)	7 (77.8)
Bachelor	1 (6.2)	0 (0)
Mother's Occupation:		
Housewife	15 (93.8)	9 (100)
Working	1 (6.3)	0 (0)
Father's Education:		
Primary	3 (18.8)	2 (22.2)
Junior	1 (6.2)	1 (11.1)
Senior	12 (75)	6 (66.7)
Father's Education:		
Private Sectors	8 (50)	2 (22.2)
employees/labourer's/migrant	5 (31.2)	6 (66.7)
Driver	3 (18.8)	1 (11.1)

Nutritional status in active TB children group were 13 children (81.2%) with good nutrition while in the most latent TB children group also in good nutrition (6 children (66.7%)). In the active TB children group it was found that there were 11 children (68.7%) showing weight loss symptoms and in latent TB children there were 4 children (44.4%) showing weight loss symptoms and there were 5 children (55.6%) showing no symptoms. MTX/Tuberculin test showed positive all in the group of active TB children (16 children) and in the latent TB children group (9 children). Likewise, the BCG vaccine for all children has had a BCG vaccine, both in the active TB children group (16 children) and in the latent TB children group (9 children). In the group of active TB children showed contact TB was found there were 15 children (93.8%) and in the group of latent TB children found that there were all TB contacts which were 9 children (100%).

Table 2. Characteristics internal factors respondents

Characteristics	Group	
	TB Active (n=16)	TB latent (n=9)
	n (%)	n (%)
Nutrition Status:		
Good	13 (81.2)	6 (66.7)
Less	3 (18.8)	2 (22.2)
Under	0 (0)	1 (11.1)
Symptoms :		
Weight loss	11 (68.7)	4 (44.4)
Cough	3 (18.8)	0 (0)
None	2 (12.5)	5 (55.6)
MTX/Tuberculin Test		
Positive	16 (100)	9 (100)
BCG Vaccinee:		
Yes	16 (100)	9 (100)
Contact to TB :		
Yes	15 (93.8)	9 (100)
No	1 (6.2)	0 (0)

Fisher's Exact test showed chest X-ray had a significant difference between active TB children and latent TB children ($p = 0.000 < 0.05$). It was shown that there were 16 children (100%) in X-foto showing TB / infiltrates in the group of active TB children and there were 9 children (100%) in Chest X-ray showing normal in the group of latent TB children. (Table 3)

However, in smear or fast molecular examination there were 10 children (62.5%) negative in the active TB children group and 9 children (100%) in the latent TB children group. This shows that there was no significant difference in microbiology or fast molecular examination of the two groups ($p = 0.057 > 0.05$).

Table 3. Characteristics of X Ray study samples

Characteristics	Group		p-value
	TB Active (n=16)	TB latent (n=9)	
	n (%)	n (%)	
Chest X-Ray			0.000
TB/ Infiltrate	16 (100)	0 (0)	
normal	0 (0)	9 (100)	
Microbiology examination			0.057
Positive	6 (37.5)	0 (0)	
Negative	10 (62.5)	9 (100)	

Note: If the p-value<0.05 means it is significant and if the p-value> 0.05 means no significant difference

Seen in the free sample t test results in Table 4 shows there is no difference in the age of the child (p = 0.175> 0.05) between children in the active TB group with the mean ± standard deviation of 62.4 ± 36.4 months with the average latent TB group of children ± standard deviation ie 85.6 ± 45.1 months.

Likewise, maternal age showed no significant difference (p = 0.262> 0.05) between mothers in the active TB children group (30.56 ± 4.29 years) and mothers in the latent TB children group (33.44 ± 8.38 years). The two mean ages of the two groups were almost the same. This means that at the age of the mother has also shown homogeneous.

Table 4. Age characteristics

Characteristics	Group		p-value
	TB Active (n=16)	TB latent (n=9)	
	Mean±SD	Mean±SD	
Children (Month)	62.4±36.4	85.6±45.1	0.175*
Mother (Year)	30.56±4.29	33.44±8.38	0.264*
Father (Year)	33.81±6.84	37.11±8.11	0.391**

Legend: If the p-value <0.05 means there is a significant difference and if the p-value> 0.05 means there is no significant difference.

* T sample test results are free

** Mann-Whitney test results

Using the Mann-Whitney test showed no significant difference (p = 0.391> 0.05) of the father's age between the fathers of the active TB children group (33.81 ± 6.84 years) and the fathers of the latent TB children group (37.11 ± 8.11 years). The two mean ages of the two groups did not differ greatly. This means that at the age of the father also showed homogeneity.

Discussion

A factor that significantly indicates the occurrence of TB in both children with active TB and latent TB is chest x-ray images showing infiltrate. Significant differences were shown in chest X- ray in the two groups, where the active TB group showed the presence of inflammation and the latent TB did not look normal. In another study it was stated that primary tuberculosis demonstrates radiologic findings that include lymphadenopathy, consolidation, pleural effusion, and miliary nodules. Radiology reports should describe whether the radiograph shows entirely normal findings, shows infiltrate, calcified granulomas, shows fibronodular scarring (noting the duration of stability), or shows findings that raise concern for active tuberculosis[11].

In both TB groups it was noted that microbiology examination testing showed the highest number was a negative result. Other studies say that children exposed to smear (+) 60% -80% are infected with TB[12]. The age distribution of children who have TB in both groups' shows that in the distribution of data about the age of the child has shown a homogeneous age. As said in previous studies that children aged <5 years have a higher percentage than age> 5 years[12]. Children aged <5 years have a greater risk of progressing infection into TB disease due to imperfect cellular immunity[13]. While, another research said that the majority of the cases of definite TB in this study were amongst the 10–15 year olds (58.3%)[14].

For the age of parents in both groups also showed homogeneity. This shows that there is no difference between the two TB groups related to the age of the parents. External factors related to the age of the parents become a factor that does not generally affect the incidence of TB in both groups.

Conclusion

The most significant determinant factor in active TB and latent TB in children is the appearance of chest X-ray, whereas active TB shows filtration and normal appearance in latent TB.

Additional Informations

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Conflict of Interest: No

Ethical Clearance: Yes

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