

Analysis of Risk Factors Related to the Occurrence of Pulmonary TB in Children

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Abstract

The proportion of pulmonary TB among all cases, children treated in Indonesia from 2007 to 2014 is ranges from 7,9% to 12%. The pulmonary TB in children is potential to cause a disability even death. This study aims to determine the relationship between sex, history of contact, socioeconomic, and nutritional status with the occurrence of pulmonary TB in children. Research design using case control. Samples were 140 children who had been treated at clinic in Palabuhanratu hospital, consisted of 70 children with pulmonary TB as cases and 70 children with not TB as a control. Data were analyzed by Chi Square test and risk factor was calculated by odds ratio. The result showed a risk factor for pulmonary TB is contact history ($p= 0,000$, $OR= 6,769$, $95\%CI: 3,165-14,479$), socioeconomic ($p=0,002$, $OR=3,375$, $95\%CI: 1,629-6,993$), immunization ($p=0,050$, $OR=2,683$, $95\%CI: 1079-6,670$) and the nutritional status ($p=0,000$, $OR=4,000$, $95\%CI: 1,889-8,468$). Promotive and preventive efforts through health education, nutrition monitoring, BCG and complete treatment of adults with active TB can avoid instances of Children Pulmonary TB.

Key Words: Children; Pulmonary TB; Risk factors.

Introduction

Tuberculosis (TB) is a leading cause of death by an infectious disease that is a public health problem in the world. Since 1993, TB disease has been declared as a Global health emergency by WHO, as it is estimated that one-third of the world population is infected by *Mycobacterium tuberculosis*. By 2012, the incidence of new TB cases is around 8.6 million cases worldwide with the mortality through 1.3 million and 75% of TB patients occurring in developing countries. WHO estimated that are 429.730 new cases of TB in Indonesian with the mortality 62.246 cases (WHO 2014). Based on the results of TB survey, the estimated new cases of TB in Indonesia in 2012 reached 185/100.000 with the mortality 27 cases (Departemen Kesehatan Indonesia 2013).

The highest risk of TB cases is in under-threes and childhood. Children are more susceptible to *Mycobacterium tuberculosis*, because of the imperfect immune system, contact with adults with tuberculosis, lack of awareness of parents to vaccinate BCG in newborn and poor quality of nutrition (WHO 2007). In 2011, an estimated 490,000 TB cases occurred among children (about 6% of the all cases). Each year, 64,000 children die from TB, making it one of the top ten causes of childhood death. In 2007, WHO showed that the global burden of children (<15 years of age) accounted for 0.6%-6% of the reported cases. ⁴ In Indonesia an incidence rate of TB among children is between 7.9%-12% and among of them with the pulmonary TB (Ministry od Health Indonesia 2011). Pulmonary TB is more commonly seen in children less than 5 years of age. Based on data pediatric clinic of Pelabuhanratu hospital, a pulmonary TB in 2012 was 251 cases, 2013 was 231 cases and 2014 is 135 cases. (clinic of pediatric Pelabuhan ratu hospital 2014).

Pulmonary TB has the potential to cause various problems, such as failure to grow, disability and even death. Often children with tuberculosis are treated late to the nearest health center or hospital, usually they are taken to the hospital after experiencing severe tuberculosis and expanding even already attacking the membranes of the brain (disseminated TB and TB meningitis).(Ministry of Health Indonesia 2011). The aim of this study is to determine the relationship between sex, history of contact, socioeconomic, and nutritional status with the occurrence of pulmonary TB in children at the clinic pediatric Palabuhanratu hospital.

Method

The research design using case control observational study.^{7,8} The sample of this study was 140 children who had been treated care at the pediatric clinic Palabuhanratu hospital, consisted of 70 children with pulmonary TB as cases and 70 children with not pulmonary TB as a control. Sampling technique in this study using simple random sampling for the control, with criteria: are the under five children who same age with the cases sample group. Data were analyzed by Chi Square test with significance level of 95% confidence interval ($p \leq 0.05$) and risk factor was calculated by odds ratio.

Result

A total of 140 are selected as this study participant's presentation of male: female ratio was: 74:66. Based on the analysis seventy children who had a history of pulmonary TB, 44 (62.9%) of them had contact with an adult suffering from TB. Fifty-two (74.3%) children had received BCG vaccination and 70 out of 35 (50%) were found malnourished with low social economic (Table 1).

Table 1. The risk factor of the pulmonary TB

No	Variable	Category responding		Total
		Cassius (%) (n=70)	Control (%) (n=70)	
1	Sex			
	Male	39 (55.7%)	35 (50%)	74 (52.9%)
	Female	31(44.3%)	35 (50%)	66 (47.1%)
2	Contact history			
	Contact	44 (62.9%)	14 (20%)	58 (41.4%)
	Not contact	26 (37.1%)	56 (80%)	82 (58.6%)
3	Immunization BCG			
	Not immunization	18 (25.7%)	8 (11.4%)	26 (18.6%)
	Immunization	52 (74.3%)	62 (88.6%)	114 (81.4%)
4	Socioeconomic			
	Low socioeconomic	35 (50%)	16 (22,9%)	51 (36,4%)
	High socioeconomic	35 (50%)	54(77,1%)	89 (63,65)
5	Nutritional status			
	Malnutrition	35 (50%)	14 (20%)	49 (35%)
	Not malnutrition	35 (50%)	56 (45,5%)	91 (65%)
	Total	70 (100%)	70 (100%)	76 (100%)

Factors associated with pulmonary TB are depicted in Table 2. On statistical analysis, it was found out that contact history ($p= 0,000$, $OR= 6,769$, 95%CI: 3,165-14,479), socioeconomic ($p=0,002$, $OR=3,375$, 95%CI: 1,629-6,993), immunization ($p=0,050$, $OR=2,683$, 95%CI: 1079-6,670) and the nutritional status ($p=0,000$, $OR=4,000$, 95%CI: 1,889-8,468) were associated with pulmonary TB.

Table 2. The risk factor associated with the pulmonary TB

No	Variable	OR (95%CI)	p value
1	Sex	1,258 (0,65-2,45)	0,612
2	Contact history	6,769 (3,17-14,48)	0,000
3	Immunization BCG	2,683 (1,08-6,67)	0,050
4	Socioeconomic	3,375 (1,63-6,10)	0,002
5	Nutritional status	4,000 (1,889-8,468)	0,000

Discussion

An increasing number of TB cases in various places at this time, allegedly caused by various things such as improper diagnosis, inadequate treatment, countermeasures program not implemented with appropriate, HIV endemic infections, migration residents, self treatment, increasing poverty, and service inadequate health. Tuberculosis of the child are an important factor in developing countries because the number of children aged <15 years is 40% -50% of the total population (Kartasasmita CB, 2009).

The incidence of pulmonary TB based on gender in epidemiology proved there is a difference between the sexes men and women. But based on the presentation of the disease that occur in children between men and women there are no meaningful differences until at the age of puberty. Based on the results of the study showed that the incidence of pulmonary TB disease can occur in children in both sexes male and female (WHO, 2007).

Contact history was greatly influenced of transmission Pulmonary TB. Tuberculosis is transmitted from an infected person to a child and a susceptible person by airborne particles (droplet nuclei). These infectious droplet nuclei are released when persons with pulmonary or laryngeal tuberculosis cough, sneeze, or laugh (Ministry of Health Indonesia, 2011). A family, whom a member was suspect of TB, have risk 4.9 greater infected than another contact (Trasih, et al, 2012). Similarly, the results of research Nevita et.al (2014) showed the relationship between the contacts history of suspect TB with a pulmonary TB in children. Contact history with adults, due the transmission of the bacteria through small droplets airborne repetitive, for example by coughing, sneezing, talking or kisses and hugs on the child, so have the opportunity 50/50 to infect children from pulmonary TB (WHO, 2007; Kuswantono, 2002).

The risk of transmission of the children of adult with TB, related to the level of protection provided by families especially mothers of children. BCG immunization is administering vaccine consists of live bacilli which eliminated virulence. BCG immunization can provide the durability of the body so childhood wasn't easily affected by Pulmonary TB disease. Based on study of WHO, BCG immunization as a protection 0-80% against *Mycobacterium tuberculosis* bacteria, but questionable BCG vaccine researchers against tuberculosis not fixed. Accordance research Briassoulis (2005), that BCG immunization cannot entirely protects children from an attack of pulmonary TB. The effectiveness of the vaccine BCG to protect most people from germs TB is at 70-80% Main (2003). The research on childhood immunization has been given BCG and apparently suffer from Pulmonary TB is likely because the children had been infected with the TB germ before given BCG immunization or the child is suffering from pulmonary TB, due to other factors such as the status of the nutrition, smoking of a member in the family, or the presence of contact history (Sterling TR.et al, 2007).

Socio-economic status is not the direct cause of the occurrence of the disease tuberculosis, however with the socio-economic condition of lacking will to fulfillment of nutrition, handling the sufferer and attitudes to disease of pulmonary TB (Supardi et al, 2014). Based on data from the WHO, 90% of TB sufferers occurs at the lower socioeconomic groups and mostly occur in the developing world by as much as 15-40%. (WHO, 2007; WHO 2014). One of the causes of the economic factor is income per capita. Per-capita income is the most important variable in the utilization of health services. It is related from the results of research showed that most of the people who are experiencing pulmonary TB disease are coming from economically disadvantaged groups. The conditions of economic constraints, although cost hospital treatment is free, but it costs transportation let alone treatment of pulmonary TB disease conducted for approximately 6 (six) months become obstacles and community considerations in seeking treatment efforts (Supardi et al, 2014).

Nutritional status was an important determinant to an occurrence of infectious diseases.(Skolimowska et al. 2012). Malnutrition or lack of calories, protein, vitamin, substances iron and others, will affect one's body resistance so susceptible to disease including tuberculosis. Decreased nutritional can affect the immune system will decrease which means the bodies disable to defense against *Mycobacterium tuberculosis* (Rosdiani, 2017). The immune conditions in children are still not perfect adults should facilitate transmission of the bacterium *Mycobacterium tuberculosis* transmitted through air spreading, usually most commonly infected in the lymph area, in part greatly destroyed by alveoli and macrophages a small portion is not successfully destroyed and continue to replicate in macrophages, macrophages will secrete proteolytic enzymes and cytokines for *Mycobacterium tuberculosis* degradation. The release of cytokines will bring in the cells, T lymphocytes that will start from the cell mediated system immunity, macrophages will introduce *Mycobacterium tuberculosis* antigen to cells T (Canadian T, 2013).

Conclusion

The risk factors of pulmonary TB in children are contact history, socioeconomic, immunization and the nutritional status. The identification of significant predictors can help determine the correct intervention to resolve the problem. These findings underscore the need for more promotive and preventive efforts through health education, nutrition monitoring, BCG and complete treatment of adults with active TB can avoid instances of Children Pulmonary TB.

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