Meta-Analysis Study of Environmental Factors Related To Pulmonary Tuberculosis (TB) In Indonesia

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Abstract*: Pulmonary tuberculosis (TB) becomes a world health problem in 2017 there were 10.4 million cases of TBC. In Indonesia TB cases increased from 330,729 cases in 2015 become 351,893 cases in 2016. These research was to find out the associated factors to pulmonary TB in Indonesia with Meta-Analysis study. These research was case-control design from the research conducted by Public Health Faculty student of Diponegoro University, Semarang Indonesia in 2007-2017. Data analysis used software Meta-analysis, called the Excel EpiYudin program. This study reviewed 34 case-control studies into the results of the study followed by a meta-analysis.The results showed the variables were related to the incidence of tuberculosis such as house temperature p-value 0,000 (OR 1.91; 95% CI 1.53-2.38), contact with patients p-value 0.029 (OR 3.59; 95% CI 2.48-5.17). The conclusion of these research were : there was association between house temperature to pulmonary TB, and there was association between contact with patients to pulmonary TB.*
Keywords*: Pulmonary TB, Meta-Analysis, Physical Environmental*

I. Introduction

Tuberculosis (TB) is an infectious disease that is concerned by most of people in the world. WHO reported that in 2017 there were 10.4 million cases of TB (CI 8.8 - 12 million) which was equivalent to 120 cases per 100,000 population with 480,000 multidrug-resistant cases increasing from the previous one which is 9.6 million cases.[1,2]

Based on the Indonesian Health Profile (*Profil Kesehatan Indonesia*) in 2016 the incidence of tuberculosis was 351,893 cases, compared to 2015 which were 330,729 cases. The highest prevalence of cases occurred in the provinces of West Java, East Java and Central Java. Those cases are 44% from the total new cases in Indonesia. Provinces with CNR (Case Notification Rate) with the highest tuberculosis cases were DKI Jakarta (269 per 100,000 population), Papua (260 per 100,000 population) Maluku (223 per 100,000 population), and North Sulawesi (219 per 100,000 population).[3]

Risk factors that lead to the incidence of pulmonary tuberculosis are divided into 2 groups of risk factors, first is population risk factors (gender, age, nutritional status, social, economic conditions) and the second is environmental risk factors (density, house floor, ventilation, lighting, humidity and altitude). Behavior and habits will also determine the air quality around it. Houses without any ventilation or perhaps not well ventilated will boost the transmission of the disease easily. In temperate regions, houses tend to be closed and air vents are mostly bad, the density of house also determines the flexibility of infectious diseases from one occupant to the other occupants. House density reduces the distance between one person and another so that transmission, if any, will be eased.[4,5]

Previous Meta-analyzes was widely used for clinical research, but in last few decades began to be used in observational studies. In order to facilitate researchers who want to carry out Meta-Analysis research, there is a protocol that has been compiled ever since observational studies called the *Meta-analysis of Observational Studies in Epidemiology* (MOOSE).[6] Based on the description above, the researchers are interested in conducting a research on Meta-analysis of factors related to tuberculosis in the territory of Indonesia.

II. Method

This research was a quantitative with a case-control study design from the results of research conducted by Faculty of Public Health students, Diponegoro University, Semarang Indonesia in 2007-2017 34 sample data analysis with a meta-analysis. Meta-analysis was a retrospective observational study, meaning that researchers make recapitulation of facts without conducting experimental manipulations.[7] Data analysis of Meta-Analysis used excel Epiyudin software.

III. Result

From Table 1 showed that the effect size p value was 0,000 with a effect size value of 0.65 (0.43-0.87).Thus it can be concluded that the effect size was statistically significant because p < 0,05 value. Then there was association between House Temperature to Pulmonary TB. And variations between these studies were heterogeneous because the value of p <0.05 or I^2 was large,so the merger model used a random effects model. The following table is describe the association between House Temperature to Pulmonary TB:

Tabel 1. Association between House Temperature to Pulmonary TB in Indonesia

Researchers	Result of each research			i2	p	Random Effects Model		
	OR	Min	Max			EGr	Min	Max
Dewi Kartika M	1.54	0.24	9.75	65.64%	0.000	0.65	0.43	0.87
Siti Fatimah	2.67	1.18	6.08					
Maria Leoni	1.10	0.46	2.65					
Bambang Ruswanto	2.94	1.27	6.77					
Andreas C. Ayomi	4.98	2.11	11.74					
Thresya Febrianti	2.36	0.81	6.93					
Tjiptowaluyo	4.40	1.59	12.19					
Setiawan Dwi Antoro	1.72	0.61	4.85					
Fitria Prihandini	0.39	0.14	1.10					
Ryana A.S. Kurniasari	2.31	0.87	6.10					
Anita Kurniasari	0.81	0.22	2.93					
Supriyo	0.39	0.20	0.78					
Saffira K. Anggraeni	1.82	0.52	6.38					
Avinda D. Damayanti	2.45	0.95	6.32					
Anggita Novia R	2.05	0.83	5.02					
La Basri	1.61	0.82	3.18					
Agustina Ayu W	8.03	3.19	20.22					
Erlin Fitria Dewi	2.61	0.87	7.80					

From table 2 showed that the p value of the effect size was 0.029 with a effect size value of 1.28 (0,91-1,64).) Thus it can be concluded that the effect size was statistically significant because the value of p <0.05. Then there was association between contacts with patients to Pulmonary TB. And variations between these studies were heterogeneous because the value of p <0.05 or I^2 was large, so the merger model used a random effects model. The association between Contacts with Patients to Pulmonary TB showed in table 2.

Table 2. Association between Contacts with Patients to Pulmonary TB in Indonesia

Researchers	Result of each research			i2	p	Random Effects Model		
	OR	Min	Max			EGr	Min	Max
Sulastri	2.04	0.59	7.00	148%	0.029	1.28	0.91	1.64
Siti Fatimah	2.70	1.03	7.08					
Bambang Ruswanto	4.40	1.74	11.12					
Dwi Nugraheni	16.00	3.58	71.53					
Sholihah Isnaini	4.20	1.18	14.94					
Tjiptowaluyo	4.67	1.54	14.14					
Fitria Prihandini	2.15	0.36	12.69					
Ryana A.S. Kurniasari	2.19	0.79	6.08					
Supriyo	4.39	0.90	21.45					
Asria Novenila Intani	3.85	1.40	10.59					

IV. Discussion

Based on those research results about house temperature and the pulmonary TB, it showed there was a statistical association between house temperature to Pulmonary TB, there was proven by the p-value <0.05, p = 0,000 and OR 1.91. Thus it can be interpreted that the house temperature was a risk factor to pulmonary TB, which means that people who lives in house temperatures <18°C - >30°C have a 1.91 greater risk of tuberculosis compared to the temperature in the house 18°C – 30°C.

House temperature <18⁰C can be influenced by several things such as bad ventilation of houses that make the house haven't enought sunlight in the house. Then the type of house floor is soil can make the mycobacterium tuberculosis still develop. This result was in line to the research of Humblet et al (2010) in Belgium there was association between house temperature and the incidence of tuberculosis. Theoretically said that mycobacterium tuberculosis can survive for many years and in a small room temperature can live 6-8 months and can be stored in a cupboard at 20°C for 2 years. The microbe will die in a temperature of 6°C for 15 - 20 minutes, also when it is exposed to direct sunlight, it will die immediately (die in a few minutes) and it takes 2 hours if it exposed to the sun indirectly.[8]

The results showed that the peoples who contact with tuberculosis patients had a risk of 3.59 times greater to suffer tuberculosis than the peoples who didn't contact with tuberculosis patients. There was a statistically significant association between contact with patients to Pulmonary TB. This result was in line to the research of Tipayamongkholgul et al (2005) in Thailand there was association between contact with patients and the incidence of tuberculosis.[9]

If someone was exposed to a history of contact to pulmonary TB patients directly then it comes to very big risk factor of tuberculosis transmitting process. Microbe from tuberculosis can be transmitted through air from positive tuberculosis BTA patients. As well as a nutritional status that is less than normal able to affect the body's resistance so that bacteria easily attack the body. From some of these things able to increase the posibly of healthy people to become illness.[10]

V. Conclusion
The conclusion of this research there was association between house temperature to pulmonary TB. There was association between contact with patients to pulmonary TB based on research results in regions of Indonesia ranged from 2007-2017. Every resident or house owners are suggested to pay attention for the sanitation aspects during the planning or even while in the middle of house constructing.

Acknowleidments

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