

**FACTORS ASSOCIATED WITH PEDIATRIC PULMONARY TUBERCULOSIS
INCIDENCE IN SURAKARTA CITY HEALTH OFFICE WORK AREA**
*Factor-Faktor yang Berhubungan dengan Kejadian Tuberkulosis Paru Anak di Wilayah Kerja
Dinas Kesehatan Kota Surakarta*

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ABSTRACT

Background: Tuberculosis is a disease of global concern. In 2018 the survey on the prevalence of pulmonary tuberculosis (TB) in children in the Surakarta City Health Office increased. **Purpose:** This study aims to analyze the correlation of household contact, second-hand smoke exposure, and exclusive breastfeeding with the incidence of pediatric pulmonary tuberculosis in the Surakarta Health Office work area. **Methods:** This research was conducted on all patients with pulmonary TB. Data was collected at Surakarta Health Office in the third quarter and are still being treated with a total of 46 cases and undertaken with the case-control method by contributing 1: 1 using 92 samples. **Results:** The results of the study showed there were a correlation of contact factors with housemates, immediate exposure factors and exclusive breastfeeding with the incidence of pulmonary TB in children in the work area of Surakarta Health Office. The respective values of p were (0.00), (0.09) and (0.03) **Conclusion:** Household contact history, second-hand smoke exposure, and exclusive breastfeeding correlated with the incidence of pediatric pulmonary tuberculosis in the Surakarta Health Office work area.

Keywords: Children, Risk Factors, Tuberculosis

ABSTRAK

Latar Belakang: Tuberkulosis merupakan penyakit yang menjadi perhatian global. Pada tahun 2018 diketahui bahwa berdasarkan survei prevalensi tuberkulosis Paru Anak di Wilayah Dinas Kesehatan Kota Surakarta terjadi peningkatan. **Tujuan:** Tujuan penelitian ini untuk menganalisis hubungan antara riwayat kontak serumah, paparan asap rokok dan riwayat ASI eksklusif dengan kejadian TB paru anak di Wilayah Kerja DKK Surakarta. **Metode:** Penelitian ini dilakukan pada seluruh penderita TB paru anak yang datanya terekap di Dinas Kesehatan Surakarta pada triwulan tiga dan masih mengalami pengobatan dengan jumlah 46 kasus dan dilakukan dengan metode *case control* dengan perbandingan 1:1 sehingga melibatkan 92 sampel. Beberapa faktor yang perlu diteliti adalah riwayat kontak serumah, paparan asap rokok anggota serumah dan pemberian ASI eksklusif. **Hasil:** Hasil penelitian diketahui bahwa ada hubungan antara faktor riwayat kontak serumah, faktor paparan asap rokok dan ASI eksklusif dengan masing-masing p value (0,00), (0,09) dan (0,03) dengan kejadian TB paru anak di wilayah kerja Dinas Kesehatan Kota Surakarta. **Kesimpulan:** Faktor riwayat kontak serumah, paparan asap rokok dan pemberian ASI eksklusif berhubungan dengan kejadian TB paru anak di wilayah kerja DKK Surakarta.

Kata kunci: Anak, Riwayat Kontak Serumah, Paparan Asap Rokok, ASI Eksklusif, Tuberkulosis

INTRODUCTION

An estimated 1 million children under 15 years became ill due to tuberculosis, and annually 140,000 children died of tuberculosis (WHO, 2015). The same condition takes place in Indonesia, the new pediatric tuberculosis cases increased from 7.1% in 2014 to 8.59% in 2015 of all age groups of tuberculosis (Indonesia Ministry of Health, 2016). Bacteriological confirmation of tuberculosis in children remains challenging by finding its infectious agent (Rigouts, 2009) thus the possible thing to do is find the factors associated with the incidence of pediatric tuberculosis. Therefore, preventive or treatment strategies can be undertaken.

The proportion of pediatric pulmonary tuberculosis cases among new tuberculosis cases recorded in Central Java in 2016 was 6.47%, and it has increased to 6.8% in 2018. Furthermore, 2,585 children infected with pulmonary tuberculosis with acid-fast bacilli (AFB) smear-positive were successfully found and treated (Central Java Health Office, 2018). In addition, Indonesia Ministry of Health (2018) stated that Central Java was the third-highest number of tuberculosis cases after East Java and West Java with 44% of all new cases in Indonesia. This became a special concern in addressing tuberculosis cases with a cross-sectoral approach.

Several studies conducted to determine the relationship between children infected with *Mycobacterium tuberculosis* showed that children have a greater risk to be exposed by active tuberculosis than adults who have a good immune system. Moreover, 74.23% of all tuberculosis cases were in children, where the high transmission rate and risk are in the 0-6 year's age group and the 7-14 years age group (Van Den, 2013).

Tuberculosis disease are more likely to occur in children (0-14 years) than adolescent and adults since the last two have better immune system (Asyary, 2015). Pediatric pulmonary tuberculosis is more complicated than the one occurs among adults. Many factors affect pediatric pulmonary tuberculosis transmission in children aside from immunity and nutrition, one of other factors is the household contact history. Children who are frequently contacted with TB patient will have a greater risk to be infected by TB (Halim et al., 2015) in this study other measurement

factors were added such as second-hand smoke exposure and exclusive breastfeeding history.

Basic Health Research 2018 report showed that the prevalence of pulmonary tuberculosis based on doctor's diagnosis did not change in percentage (0.4%), the prevalence of pulmonary tuberculosis in Central Java based on diagnosis was 0.4% (Basic Health Research, 2018). In 2017, Tuberculosis cases in Central Java was 1,020,000 patients, yet only 35.4% (360,564 patients) were reported, and there was 64.6% (659,435 patients) of missing case. Meanwhile, the surveillance data of TB patients in Central Java in 2019, from the estimated 103,840 cases, only 44.33% (48,751 patients) were reported, whilst there were 55,089 patients have not been found/reported (Central Java Health Office, 2018). Moreover, there were some cities in Central Java with the highest tuberculosis cases, one of which was Surakarta. The number of pediatric pulmonary tuberculosis in 2018 was 48 cases in the 0-14 year's age group, and in 2019 there were 70 children aged 0-14 years tested positive for pulmonary tuberculosis (Surakarta City Government, 2018).

This study aimed to analyze the relationship between household contact history, second-hand smoke exposure, and exclusive breastfeeding history with the incidence of pediatric pulmonary tuberculosis in the Surakarta Health Office work area.

METHOD

This was an analytic observational research with case-control design study. This study was conducted in the work area of the Surakarta Health Office in October to mid-November 2019. The population of the study was all pediatric tuberculosis patients aged 0-14 years who were still in the treatment period at the time this study was conducted with a total of 50 children in 2019 based on data reported by the Surakarta Health Office. The sampling technique used in the case group was saturated sampling.

Variables in this research were pediatric tuberculosis as independent variable and factors associated with the incidence of tuberculosis (household contact history, second-hand smoke exposure, and exclusive breastfeeding history) as dependent variable. Data were analyzed using univariate and

bivariate analysis. Univariate analysis was and percentage of variables in the study. Bivariate analysis was used to analyze the relationship between each dependent variable (household contact history, second-hand smoke exposure, and exclusive breastfeeding history) with the incidence of pediatric pulmonary tuberculosis using chi-square test.

RESULT

Samples of this research were toddlers, yet mothers of toddlers were involved as research respondents. The toddlers have not been able to provide answers or fill in and sign the informed consent for this research study. Sample characteristics consist of age and sex, while the respondent characteristics were age and latest formal education.

This study was involving 46 respondents, four were excluded since the address of three case groups could not be found and another case was not willing to become the research respondent. Meanwhile, the control group were selected from the nearest neighborhood of the case group aged <

used to determine the frequency distribution 14 years, never been diagnosed with pulmonary tuberculosis, were not currently experiencing pulmonary tuberculosis symptoms, family members were willing to be research respondent until the end of the study by signing the inform consent after being explained. This research using 1:1 case-control study design, thus the sample size was 46:46 which was 92 samples.

According to Table 1, the respondents' characteristics who were the mothers of the sample, mostly were aged 30-<40 years both from the case group 50% and the control group 63%. The majority of the respondents' latest formal education was Senior High School with 39.1% for the case group and 65.2% for the control group. While the samples' characteristics used in this study consisted of case groups and control groups, most of whom were toddlers with 52.2% for case group and 56.5% for control group. Of these, 54.3% of case groups and 52.2% of control groups were recorded as male.

Tabel 1. Frequency Distribution of Respondents' and Samples' Characteristics

Characteristics	Case		Control	
	N	%	N	%
Respondent				
Age				
20-<30 years	10	21.7	6	13
30-<40 years	23	50	29	63.1
40-<50 years	12	26.1	10	21.7
50-<60 years	1	2.2	1	2.2
Latest Formal Education				
Primary School	2	4.3	1	2.2
Junior High School	11	23.9	7	15.2
Senior High School	18	39.1	30	65.2
Diploma	1	2.2	0	0
Undergraduate	5	10.9	3	6.5
Graduate	9	19.6	5	10.9
Sample				
Age				
0-5 years	24	52.2	26	56.5
6-10 years	16	34.8	15	32.6
11-14 years	6	13	5	10.9
Sex				
Male	25	54.3	24	52.2
Female	21	45.7	22	47.7

Sample characteristics as shown in Table 2, 67.4% of case group sample in this study had a household contact history whereas

the entire control group (100%) had no household contact history with tuberculosis patients. However, in the second-hand smoke

exposure variable, majority of the case group (52.2%) as well as the control group (78.3%) exposed to second-hand smoke from family members who lived in the household. The case groups and control groups had a similarity in

the exclusive breastfeeding variable, that most of the case groups (84.8%) and control groups (65.2%) had been exclusively breastfed by their mothers.

Tabel 2. Bivariate Analysis of the Factors Associated with the Incidence of Pediatric Pulmonary Tuberculosis in the Surakarta Health Office Work Area

Characteristics	Case		Control		p-value	OR	95% CI
	N	%	N	%			
Household Contact History							
Yes	31	67.4	0	0	0.000		
No	15	32.6	46	100			
Second-hand Smoke Exposure							
Yes	24	52.2	36	78.3	0.009	0.30	0.12-0.75
No	22	47.8	10	21.7			
Exclusive Breastfeeding History							
Yes	39	84.8	30	65.2	0.030	0.33	0.12-0.92
No	7	15.2	16	34.8			

DISCUSSION

Relationship between Household Contact History and the Incidence of Pediatric Pulmonary Tuberculosis

The odds ratio (OR) value for household contact history was not known because there was one empty cell where none of the control groups has a household contact history with TB patients. A research conducted by Steven (2014) in Brazil showed that children who had contact with tuberculosis patients in the household have 31.6 times greater risk of getting infected by tuberculosis. Researches by Ajiz *et al.* (2009) and Halim *et al.* (2015) also have similar results. In line with those research results, research conducted by Apriliasari (2018) has OR value of 3.143 which means that the respondent has a household history with the adult pulmonary TB patient.

Other researches by several researchers also revealed that there was a correlation between household contact history and pediatric tuberculosis incidence, those were researches by Budiarti (2018) in the Pati Community Health Center, Saputri *et al.* (2020) in the Central Jakarta Public Health Center, and Nandariesta *et al.* (2019) in Wonosobo District.

Crofton *et al.* (2002) stated that children tuberculosis patients were almost always got the bacteria infection by their family members. Furthermore, Chin (2009) found that family members who lived in the same household as pulmonary tuberculosis patients had a greater risk of obtaining the infection because they

could not be able to avoid contact with the patient. *Mycobacterium tuberculosis* exposed for a long time and in the same household carries 30% risk of infection.

As can be seen in Table 2, the *p-value*=0.000 indicated that there was a significant correlation between the household contact history factor and pediatric tuberculosis incidence in the Surakarta Health Office work area. The determination of household contact history as one of the diagnosing pulmonary tuberculosis indicators in the scoring system showed that this was an important factor in the tuberculosis bacteria infection process in children. According to the Indonesia Ministry of Health (2013), children who have significant contact with smear-positive tuberculosis patients has a 24.4%-69.2% risk of being infected with pulmonary tuberculosis compared to the children who have no significant contact history. In the pediatric pulmonary tuberculosis case, the source of transmission must be found by identifying the family members who lived in the same house or other people who have close contact in the past 3 months.

So far, the transmission of tuberculosis caused by frequent contact with patients became an important risk factor of the infection. If there was household contact, other family members must be more aware and mindful especially in performing activities that allowed the tuberculosis bacteria infection to spread within the family. Several activities have been carried out by the family members

such as separating eating utensils, not spit sputum carelessly, and practicing good personal hygiene. There were 15 pediatric pulmonary tuberculosis cases in this research which have not a household contact history, but several respondents stated that they have contact with tuberculosis patients in the last six months. The tuberculosis patients have contact with their neighbors and playmate. However, this research was not following the contact frequency thus this could not be discussed further in this study.

Relationship between Second-Hand Smoke Exposure and the Incidence of Pediatric Pulmonary Tuberculosis

Second-hand smoke exposure in this study was the exposure to cigarette smoke that has been received by samples from family members who lived in the same house. Smoking interferes with the respiratory defense mechanism to optimally work, the cigarette smoke stimulates the production of mucus and damages the cilia, thus the mucus thickens and increase the risk of bacterial growth including the *Mycobacterium tuberculosis* which makes the body more vulnerable to pulmonary tuberculosis infection (Indonesia Health Ministry, 2011).

A research by Kirengga (2015) showed some risk factors for tuberculosis patients in Kampala, Uganda. Children who slept closely with an active smoker in the same household had 3 times greater risk of *Mycobacterium tuberculosis* infection compared to those who have no active smoker in the family (OR: 8.0 [95% CI:2.74-23.29] compared to 2.4 [95% CI: 1.17-4.92], $P < 0.001$). The research result by Kirengga was similar with this research, statistical test result proved that there was a relationship between second-hand smoke exposure received by samples and tuberculosis incidence despite the low OR value (0.3).

The smoking habit of family members which was an active smoker at home often accompanied by few activities such as interacting with children, hence the children became passive smoker. Tobacco smoke endangered children's health, especially for children who have a household contact history with tuberculosis patients and those who were exposed to second-hand smoke. Careless smoking habit lead to bad impact on those around the active smoker.

Bam et al. (2015) stated that second-hand smoke exposure increases the risk factor of TB infection and develop active TB case among children and adults. TB patients who smoke at home put their families at greater risk of TB infection. Therefore, TB patients who are exposed to second-hand smoke must be more careful and avoid cigarette smoke exposure as much as possible. According to Saidah and Syamsiar (2020), there was a significant relationship between smoking habit and tuberculosis incidence among adults in the Guali Public Health Center in 2016. So was the research by Kakuhe *et al.* (2020), proved that smoking habit had a relevant correlation with pulmonary tuberculosis case in the Tuminting Public Health Center work area in Manado. This explanation showed that second-hand smoke exposure affected both active and passive smoker well-being mainly the tuberculosis incidence.

Cigarette smoke exposure in the household causes environmental pollution and affects air quality which family members inhale. Passive smoker family members are in an unhealthy environment if smoking habit occurs inside the house. A result of the study showed that contacts of TB patients are at a greater risk of obtaining TB infection depending on factors such as type of contact infectiousness of source case and environmental characteristics (Lhagari, 2019).

Relationship between Exclusive Breastfeeding and the Incidence of Pediatric Pulmonary Tuberculosis

Immunity was an important factor in determining an individual's health. Breast milk produced by mother supported the baby's immune system. According to Aziz (2018), breastfeeding helped to prevent baby from infectious disease. Indonesian Pediatric Society (2018) stated that a research examined by WHO proved that 2 years of breastfeeding protects against diarrhea deaths and reduced the risk of acute respiratory infection.

Breast milk is baby's primary source of nutrition given by mother, but not all babies were exclusively breastfed for 6 months. In this study, a great number of children tuberculosis patients as well as the control groups were exclusively breastfed. Only a few of the respondents said that they could not exclusively breastfeed their babies because they were working mothers thus mothers

provided breast milk along with formula milk. Bivariate analysis result signified there was a relationship between exclusive breastfeeding history and tuberculosis incidence with p -value=0.03. This result is in line with a study by Saman (2013) which stated that there was a significant correlation between exclusive breastfeeding with the incidence of pediatric pulmonary tuberculosis. However, the result of this study is differ from the previous study by Arizka (2020), by carrying out a spatial analysis of factors of pediatric tuberculosis incidence in Padang proved that there was no correlation between exclusive breastfeeding with the prevalence of pediatric tuberculosis with p -value=0.195. Unlike the result of this study, research by Laksono (2018) stated that there was no correlation between exclusive breastfeeding with the incidence of pediatric tuberculosis (p -value=0.666) in the Kebong Public Health Center work area in Kelay District, Sintang Regency.

Breast milk contained lysozyme and Immunoglobulin A (IgA), these substances can break down the walls of gram-negative bacteria cells such as Mycobacterium tuberculosis. Breast milk given to babies developed baby's immunity and prevented them from illness, especially infectious disease (Indonesian Pediatric Society, 2018). Breast milk was important for children's immunity system thus mothers were expected to breastfeed their child for 6 months without any additional food.

CONCLUSION

Household contact history, second-hand smoke exposure, and exclusive breastfeeding have a correlation between the incidences of pediatric pulmonary tuberculosis in the Surakarta Health Office work area. Further research is expected to examine the contact history both at home and outside the house and second-hand smoke exposure at home and outside the house comprehensively.

SUGGESTIONS

To reduce household contact with tuberculosis patients, children's bed should be separated from the patient's furthermore family members who are active smokers may not smoke near the children to decrease the second-hand smoke exposure.

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