



## The Relationship between Family Smoking Habits and Tuberculosis Incidence in Children Aged 3-6 Years in Bandung Regency

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### Abstract

Childhood tuberculosis in Indonesia is the third most common in the world, in 2020 the number of new child Tuberculosis cases decreased by 32.4%, this is still far from the government's target in 2024, which is 90%. Bandung Regency has 62 health centers, the highest number of child TB cases is at the Linggar Health Center, namely 42 children with Tuberculosis due to family factors that have smoking habits. The aim of the study was to determine the relationship between family smoking habits and the incidence of Tuberculosis in children aged 3–6 years in the Working Area of the Linggar Health Center. This type of research uses casecontrol with a population of 60 families with children aged 3-6 years. The sampling technique used purposive sampling the sample is 60 families. Data collection using the Riskesdas 2018 questionnaire. Data analysis used univariate and bivariate analysis. The results of the study most of the cases (76.7%) were smokers while the controls (60%) were non-smokers. Family smoking status (P-value 0.004), type of white cigarette (P-value 0.002), number of cigarettes <12 cigarettes (P-value 0.006), duration of smoking > 19 minutes (P-value 0.000), and smoking in the house (P-value 0.001) has a relationship with TB in children. Of the five, smoking duration >19 minutes is the riskiest for TB in children (OR 19,286) because the longer the duration of family smoking, the more influential it is on the incidence of tuberculosis in children aged 3-6 years considering the content of smoking can reduce children's immunity. The conclusion of the study is that there is a relationship between family smoking habits and TB in children aged 3-6 years in the Working Area of the Linggar Health Center.

*Keywords:* Children, smoking habits, family, tuberculosis.

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### 1. Introduction

Tuberculosis is a chronic infectious disease, caused by the invasion of very small *Mycobacterium tuberculosis* bacteria, spread from individual to individual through droplets of sputum of TB sufferers. Children can get TB at the age of 0-14 years. Its transmission is direct and fast, so it is estimated that 9.9 million world population have been infected with TB with 1.1 million cases of TB being children under 15 years old. There are 30 countries with a high burden of TB reporting that the spread of this disease is still out of control (World Health Organization, 2022).

WHO (World Health Organization) together with the UN (Association of Nations) responded to the report by designing a strategy to end the Tuberculosis epidemic as outlined in the sustainable development goals (SDGs), with the hope that by 2035 there will be an 80% reduction in Tuberculosis incidence (Iskandar et al., 2023). The Asian continent is the continent with the most Tuberculosis findings in children, and Indonesia is ranked third in the world in cases of Tuberculosis findings in children, so the government has set a target in Presidential Regulation No. 67 of 2020 to reduce the incidence of Tuberculosis in children by 90% in 2024 (Kemenkes RI, 2020).

The target of reducing Tuberculosis cases in children in Indonesia in 2020 has only reached 32.4% of the target of 90%, with a total of 32,816 cases, a decrease compared to the findings of cases in 2019 which reached 63,111 people (Kemenkes RI, 2020). The province with the highest cases of Tuberculosis in children is West Java Province with 11,482 cases. Bandung Regency is the second region with the most cases of Tuberculosis in children, reaching 1,611 cases, after the City of Bandung with findings of Tuberculosis in children totaling 1,899 cases. Of the 30 subdistricts in Bandung Regency, Rancaekek District is the District with the highest cases of Tuberculosis in children, reaching 75 cases. Rancaekek District consists of 3 (three) Health Center namely Linggar, Rancaekek, and Nanjungmekar Health Centers with the most reports of Tuberculosis in children being at the Linggar Health Center, totaling 42 cases. From

2019 - 2021 the most findings of child Tuberculosis cases at the Linggar Health Center were 77 cases occurring in children aged 3-6 years (Dinkes Jawa Barat, 2020).

Previous studies have stated that the incidence of tuberculosis in children can occur in children aged less than 5 years (Blount et al., 2021). The highest cases of tuberculosis at the Linggar Health Center occurred in children aged 3-6 years. Children aged 3-6 years are included in the category of preschool children, which is the optimal period for children to start showing attention to health and tend to be more dependent. Children aged 3-6 years are also called The Wonder Years, which is when a child has a great curiosity about something. Children who have good early growth and development can make them grow into healthier individuals, whereas a child who is sick can interfere with the achievement of the development period. Someone with a chronic condition often faces delays in the developmental period, especially children with tuberculosis (Bodrova & Leong, 2003).

Tuberculosis in children has decreased. This can happen because parents who have children with tuberculosis find it difficult to distinguish the symptoms of tuberculosis from those of the common cold, so it is considered that tuberculosis in children is not a serious health problem, so parents rarely check their children to health services. (Anggraini et al., 2021). The impact of Tuberculosis on children if not treated immediately can result in Tuberculosis meningitis which is most often found in children, impaired growth and development, and even death (Musfirah, 2022).

The impact of Tuberculosis can cause serious health problems for sufferers if treatment is late, so the government has one of the Tuberculosis programs, namely controlling the risk factors that cause tuberculosis (Kemenkes RI, 2020). The risk factors for Tuberculosis in children occur due to the BCG immunization factor, the child's nutritional status, the child's weight at birth, and the smoking behavior of both parents. Of these four factors, parental smoking behavior has a risk of 0.536 times greater in children who do not have parents. For those who smoke, these factors are more at risk than BCG immunization factors (Lawalata & Talarima, 2020).

The role of the family is an important factor in the success of pediatric TB patients in achieving recovery, considering that children are still very dependent on their families (Al Fitry et al., 2022). Friedman in Teli & Selasa, (2021) stated that one of the five functions of the family, namely the function of health care with the family's task of maintaining a home atmosphere that is favorable for health, can be by presenting a home atmosphere that is free from exposure to cigarette smoke, especially in children, due to the existence of a family that active smoker at home (Teli & Selasa, 2021)

Smoking activities carried out by active smokers can cause people around them who do not smoke to be exposed to cigarette smoke, thus making the person a passive smoker (Greenberg et al., 2006). According to the 2020 Indonesia Health Profile data, West Java is one of the provinces with the highest smoking percentage at 32.68%. Most exposure to cigarette smoke is inside the house compared to exposure to cigarette smoke outside the home (Drope et al., 2018). Increasing the risk of infection and lowering the immune system are the dangers caused by exposure to cigarette smoke inhaled by passive smokers (Nikmah et al., 2018).

Passive smoking can cause tuberculosis in children (Patra et al., 2015). Passive smoking in the family is not only from the wife, but the whole family can become passive smokers, such as children and toddlers (Puate-Maestu et al., 1998). Secondhand smoke can cause serious health problems in children. Various research results show that children whose families smoke are more likely to get sick. Their lungs grow less than children who do not inhale secondhand smoke, and they are more likely to suffer from bronchitis, pneumonia, and tuberculosis (Bodrova & Leong, 2003).

Based on a preliminary study with health workers on March 5 2022 at the Linggar Health Center, it was found that in 2021 there were 35 cases of childhood tuberculosis. The results of interviews with 5 families who have children suffering from tuberculosis, obtained data, all families have children suffering from tuberculosis aged 3-6 years, and 4 of them have family members who are active smokers, while 1 family has children with tuberculosis, not have a family member who smokes. The four families with family members who are active smokers were found to all carry-out smoking activities at home with an average number of cigarettes smoked per day of fewer than 12 cigarettes. Based on the phenomenon above, researchers are interested in researching "The relationship between family smoking habits and the incidence of tuberculosis in children aged 3-6 years in Bandung Regency"

## 2. Literature Review

Some of the previous studies that became the reference in this study are as follows: Research conducted by Patra et al. (2015) entitled "Second-Hand Smoke and the Risk of Tuberculosis in Children and Adults: A Systematic Review and Meta-Analysis of 18 Observational Studies" used a systematic review and meta-analysis research design. The results of the study found that there was a relationship between passive smoking and the incidence of tuberculosis in children. It has not specifically explained the age characteristics of children exposed to tuberculosis and other factors, so additional studies are needed to clarify the incidence of tuberculosis in children. Another study was conducted by Blount et al. (2021) entitled "Indoor Air Pollution and Susceptibility to Tuberculosis Infection in Urban Vietnamese Children" using a cross-sectional study design. The results of the study found that exposure to cigarette smoke produced by smokers who carry out smoking activities in the house will have a lot of impact on children under

5 years of age, especially the impact on the possibility of infection caused by tuberculosis germs. The research conducted by Lawalata & Talarima (2020) entitled "Risk Factors for Child Tuberculosis in Ambon City in 2019" used a case-control study research design on 88 respondents. The results of the study found that the risk factors for tuberculosis in children can be caused by several factors including immunization, nutritional status, birth weight, parents' smoking behavior, and household contacts. The smoking behavior factor of parents has an impact on children exposed to tuberculosis with a risk of 0.536 greater than children whose parents do not have smoking behavior.

### 3. Materials and Methods

#### 3.1. Materials

This type of research used is quantitative research. Analytical observational research design with a case control (retrospective) research approach. The population in this study were families with children aged 3-6 years who were in the Working Area of the Linggar Health Center, totaling 60 families. A sample of 60 families with children aged 3-6 years consisting of a case group of 30 families and a control group of 30 families, the sampling technique used was purposive sampling with inclusion and exclusion criteria. The sample was divided into two groups, namely the case group and the control group, each with a sample of families with children aged 3-6 years. The control group of children without a diagnosis of tuberculosis and the sample group of children with a diagnosis of tuberculosis. This study used an instrument, namely the Indonesian Ministry of Health's questionnaire regarding Basic Health Research 2018. Medical record records were used to obtain data on the number of children with tuberculosis, patient age, patient gender, and address of residence of child tuberculosis patients at the Linggar Health Center, as well as reconfirm medical diagnoses of patients.

Questionnaires were used to determine family smoking habits, which consisted of family smoking status, the number of cigarettes consumed by the family each day, types of cigarettes consumed by the family, family smoking duration, and family smoking rooms. Questionnaires were used to obtain patient and family identification data to confirm the child's tuberculosis status.

#### 3.2. Methods

The research sample was divided into two groups. Each group was given a questionnaire. Researchers distributed questionnaires to the control group randomly in families whose children were diagnosed with diseases other than Tuberculosis, while the case group was in families who had children with Tuberculosis. The researcher asked respondents directly through a questionnaire regarding family smoking habits (smoking status, smoking duration, type of cigarette consumed, number of cigarettes consumed, and smoking room), while for age, gender, and Tuberculosis status of the child the researcher only reconfirmed for ensure. Questions related to the types of cigarettes used by the researcher attached pictures of the three types of cigarettes to avoid misunderstandings. The research questionnaire was filled out by the researcher by obtaining answers by asking the respondents directly. Questionnaires that have been filled in completely are checked again by the researcher, who will then carry out data processing and data analysis.

Data analysis was performed using univariate and bivariate analysis. The univariate analysis uses the frequency distribution, while the bivariate analysis *Chi-square test*. The results of the analysis, namely whether there is a relationship or not in this study, can be obtained by comparing the a significant value of p with a significance of 0.05, namely if the *P-Value* < 0.05 then  $H_0$  is rejected and it is said that there is a relationship between the two variables whereas if the *P-Value* is > 0.05 then  $H_0$  is accepted which means there is no relationship. The independent variable is related to the risk a factor that causes the effect to occur, if the *OR (odds ratio)* value is > 1 then the independent variable is a risk factor, if the *OR (odds ratio)* value is < 1 then the independent variable is not a risk factor.

### 4. Results and Discussion

#### 4.1. Proportion of Family Smoking Habits in the Work Area of the Linggar Health Center

**Table 1:** The Proportion of Smoking Habits in Families in the Work Area of the Linggar Health Center

Family smooking area	Child TB		Non-TB Child	
	n	%	N	%
<b>Family Smoking Status</b>				
Smoking	23	76.7	12	40
Do not smoking	7	23.3	18	60
Amount	30	100	30	100

<b>Number of cigarettes</b>				
<12 sticks	19	63.3	10	33.3
>12 sticks	4	13.3	18	6.7
Not exposed	7	23.4	30	60
Amount	30	30		100
<b>Family cigarettes</b>				
Kretek	8	26.7	7	23.3
White	15	50	5	16.7
Hand-rolled	0	0	0	0
Not exposed	7	23.3	18	60
Amount	30	100	30	100
<b>Smoking duration</b>				
1 – 5 Minute	0	0	0	0
6 – 19 Minute	8	26.7	10	33.3
>19 Minute	15	50	2	6.7
Not exposed	7	23.3	18	60
Amount	30	100	30	100
<b>Family Smoking Room</b>				
Inside the house	16	53.4	5	16.7
Outside the house	7	23.3	7	23.3
Not exposed	7	23.3	18	60
Amount	30	100	30	100

Based on the table above, shows that the majority of families with child Tuberculosis (cases) are smokers, 23 people (76.7%) spend <12 cigarettes/day, 19 people (63.3%) choose white cigarettes, 15 people (50%) and spent time smoking >19 minutes/day by 15 people (50%) and chose to smoke inside the house by 16 people (53.4%). While in the control group most of them were not smokers as many as 18 people (60%).

#### 4.2. The Relationship between Family Smoking Habits and the Incidence of TB in Children Aged 3-6 Years in the Work Area of the Linggar Health Center

**Table 2:** The Relationship between Family Smoking Habits and the Incidence of TB in Children Aged 3-6 Years in the Work Area of the Linggar Health Center

<b>Kebiasaan Merokok Keluarga</b>	<b>Nilai P (P&lt;0.05)</b>	<b>Nilai OR (OR&gt;1)</b>
<b>Family Status Smoking</b>		
Smoking	<b>0.004</b>	4.929
Do not smoking		
<b>Number of cigarettes</b>		
≤12 sticks	<b>0.006</b>	4.886
>12 sticks	0.103	4.571
<b>Family cigarettes</b>		
Kretek White	0.109	2.939
	<b>0.002</b>	7.714
<b>Smoking duration</b>		
6 – 19 minutes	0.264	2.057
>19 minute	<b>0.000</b>	<b>19.286</b>
<b>Family smoking room</b>		
Inside the house	<b>0.001</b>	8.229
Outside the house	0.169	2.571

In the smoking duration sub-variable, with  $P\text{-Value} = 0.000$ ,  $H_0$  the table above shows the results of bivariate analysis on the sub-variable Family Smoking Status with  $P\text{ value} = 0.004$  meaning that  $H_0$  is rejected, meaning that there is a relationship between family smoking status and the incidence of Tuberculosis in children. In the sub-variable Number of Cigarettes,  $P\text{-Value} = 0.006$ , so  $H_0$  is rejected, meaning there is a relationship between the number of cigarettes <12 cigarettes/day and Tuberculosis in children. Cigarette type sub-variable obtained  $P\text{-Value} = 0.002$ , it is said that  $H_0$  is rejected, which means there is a relationship between white cigarettes and the incidence of Tuberculosis in children.

In the smoking duration sub-variable, with  $P\text{-Value} = 0.000$ ,  $H_0$  is rejected, which means that there is a relationship between family smoking duration of >19 minutes and child Tuberculosis. The smoking room sub-variable obtained  $P\text{-Value} = 0.001$ , then  $H_0$  was rejected, meaning that there is a relationship between smoking in the house and child Tuberculosis. Of the five sub-variables, family smoking duration > 19 minutes is the sub-variable that is most at risk for the incidence of tuberculosis in children aged 3-6 years with an  $OR$  (Odds Ratio) = 19.286 meaning that children will be 19.286 times at risk of being exposed to tuberculosis.

Smoking status in at-risk families in the incidence of Tuberculosis in children aged 3-6 years, with an  $OR$  value of 4.929, the child is 4.929 times at risk of being exposed to Tuberculosis. Smoking is said to have become a very common and common habit in Indonesian society, even though smoking is a risk factor for various types of diseases, smoking is very difficult to eliminate from people's daily lives (Yu et al., 2017). People who indirectly inhale cigarette smoke are called passive smokers or secondhand smokers. Some people still think that being a passive smoker is safe. Even if you don't smoke, being in an environment full of cigarette smoke can still harm your body. Cigarette smoke exhaled by active smokers is more dangerous than the smoke inhaled by the smoker himself (Bayard, 1993). The research conducted by researchers complements the research conducted by den Boon et al. (2007) regarding the relationship between family smoking status and the incidence of childhood tuberculosis. The two studies both studied Tuberculosis in children but the study by den Boon did not specifically describe the age of children suffering from Tuberculosis and the odds ratio value (den Boon et al., 2007).

Family members who spend <12 cigarettes per day with TB incidence in children aged 3-6 years have a risk of 4.886 times greater than children who are not exposed to secondhand smoke. One cigarette contains 400 harmful substances and cigarette exhaust contains five times the carbon monoxide, three times the tar and nicotine, and up to 46 times more ammonia than the smoke inhaled directly by an active smoker. That is if family members who smoke can spend <12 cigarettes per day, children, in this case acting as passive smokers, can inhale a maximum of 60 times more carbon monoxide, nicotine, and 36 times more tar compared to active smokers (Huriah & Rahman, 2021). The more often a person is exposed to cigarette smoke, the higher the risk of developing pulmonary Tuberculosis, because the air exposed to cigarette smoke contains harmful chemicals produced by burning cigarettes (Gülsen et al., 2020). The research conducted by researchers complements research from Aditama (2019) regarding the transmission of pulmonary tuberculosis to family members of sufferers caused by the amount of cigarette consumption per day. The study by Aditama did not explain how big the risk factor was for the number of cigarettes consumed by the family in the transmission of tuberculosis to family members of sufferers (Aditama, 2019).

Children whose family members consume white cigarettes are at risk of 4.714 times experiencing TB Tuberculosis. White or filter cigarettes are tobacco cigarettes made from two main leaves, namely Virginia leaves which contain 2.5 – 3% nicotine, and burley tobacco which has a higher nicotine content of around 3.5 – 4%. Of course, the content in filtered cigarettes is different from non-filter cigarettes, but the content is filtered or white cigarettes have nicotine levels that are equivalent to clove cigarettes, even though they have filters that can filter around 25 – 50% tar and tobacco. Filter cigarette smoke if inhaled by children can damage the control power possessed by macrophages to kill the germs that cause Tuberculosis.

The duration of family smoking for > 19 minutes with the incidence of TB in children, and  $OR = 19.286$  means that children have a 19.286 time the risk of experiencing Tuberculosis. The more cigarettes smoked, the greater the time spent smoking daily so that the duration or duration of smoking exacerbates the occurrence of pulmonary Tuberculosis and the convention is late. In the previous study by den Boon et al. (2007), it was not conveyed how much impact the duration of smoking had on tuberculosis in children, so the research conducted by the researchers perfected the previous research.

Smoking in the house with the incidence of TB in children and the value of  $OR = 8.229$  so children are at risk of 8.229 times being exposed to TB. The room of the house is one of the factors that allows children to inhale cigarette smoke more easily. Children who live with families who smoke indoors are more at risk of contracting respiratory diseases. A house filled with cigarette smoke can increase the risk of passive smokers suffering from a disease. Exposure to cigarette smoke in passive smokers, especially in the house, makes the air mixed with smoke contain toxins which then become infections and reduce the body's immunity. Smoking in the house causes tools at home to become transmission media for disease transmission. The smoke that is discharged into the air in the house will leave toxic substances in the furniture which over time will make all the household furniture contaminated and cause air pollution in the room. The more active smokers in the house, the higher the transmission rate of Tuberculosis in children. Given that children aged 3-6 years are still dependent on their families (Al Fitry et al., 2022).

## 5. Conclusion

The results of the study can be concluded:

1. In proportion of family smoking habits, most children live with smoking families (76.7%) with white cigarettes (40%), smoking duration > 19 minutes (50%), number of cigarettes <12 cigarettes per day (63.3%) and smoking inside the house (53.4%). Meanwhile, most of the controls were non-smokers (60%).
2. There is a relationship between family smoking habits (families who smoke, consume <12 cigarettes/day, type of white cigarette, smoke duration > 19 minutes, and smoke in the house) with the incidence of tuberculosis in children aged 3-6 years at the Linggar Health Center.

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