

Ecological Analysis of Children Tuberculosis (TB) in Indonesia

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Article Info:

Submitted:
08-01-2024
Revised:
06-02-2024
Accepted:
12-02-2024

DOI:

<https://doi.org/10.53713/nhsj.v4i1.328>



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ABSTRACT

Tuberculosis (TB) in children is one of the causes of child mortality. Children and toddlers are very susceptible to exposure to tuberculosis germs, especially if there is a family that is confirmed to have Tuberculosis (TB) bacteriological notification. The purpose of this study was to analyze the poverty rate, active integrated healthcare center (Posyandu), and BCG Immunization related to Child TB Cases in Indonesia. The study design that was used is an ecological study approach (aggregate study) sourced from the 2019 Indonesian Health Profile data. Bivariate analysis was conducted using a scatter plot and Pearson correlation test. The results showed that the disparity in the percentage of Tuberculosis (TB) incidence in children was very high at 136.3% in West Java and the lowest in Aceh province at 9.6%. The results of the scatter plot and bivariate test showed that the greater the number of poverty rates, there is a tendency for the incidence of TB in children to be high, the more integrated healthcare center (Posyandu) active in an area, the higher the TB incidence in children, and the more children being immunized with BCG, the cases of Tuberculosis (TB) in children are also increasing. It was concluded that the poverty rate and active integrated healthcare center (Posyandu) had a positive relationship, while BCG immunization had a negative relationship with the incidence of Tuberculosis (TB) in children. It is recommended that the government develop special policies on target areas with the highest poverty rates and increase the activity of integrated healthcare center (Posyandu) in areas where the achievement of child Tuberculosis (TB) is still low, as well as increasing BCG immunization in areas with the most Tuberculosis (TB) cases in children to break the chain of transmission in the future.

Keywords: Tuberculosis (TB) children; integrated healthcare center (Posyandu); BCG immunization

INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease that is transmitted due to *Mycobacterium tuberculosis* infection. Tuberculosis usually attacks the lungs (pulmonary TB) and can also attack other body organs (extrapulmonary TB) (Kurniyawan et al., 2023). TB in children is an infectious disease that occurs in children aged 0-14 years. The presence of tuberculosis in children can explain the effectiveness of tuberculosis control programs such as the detection of adult tuberculosis cases, contact tracing, and BCG vaccination, which is an immunization that must be given to babies to prevent tuberculosis (Pratiwi et al., 2021).

According to the Indonesian Ministry of Health's data (Indonesian Ministry of Health, 2019), in 2017 there were 10 million cases of TB in the world and there are 1.6 million people who died of TB. Among these cases, there are 1 million cases of TB in children (0-14 years) which are estimated to be around 7.5 million children are infected with TB every year. In addition, more than 1 million new pediatric TB cases occur yearly.

The integrated healthcare center (Posyandu) is a basic health activity organized by the community and assisted by health workers in a public health center work area. An integrated healthcare center is a strategic step in developing the quality of human resources so they can build and help themselves, so their development needs to be improved. The benefits of an integrated healthcare center for the community are ease of obtaining basic health services, obtaining assistance in solving health problems, and efficiency in obtaining integrated services (Susanti et al., 2020).

BCG immunization is a live vaccination given to babies to prevent tuberculosis, derived from the *M. Tuberculosis bovinum* strain which contains 50,000-1,000,000 particles/dose. The results of the study reported that immunity emerged

6-8 weeks after BCG immunization. The immunity that occurs is not complete so it is still possible for super infections to occur, although usually they are not progressive and cause serious complications (Rahmawati & Rosita, 2021).

This study aims to analyze the poverty rate, active integrated healthcare center (Posyandu), and BCG Immunization related to Child TB Cases in Indonesia. This ecological variable, an aggregate number, is crucial because it will provide an overview and targets for policymakers as the basis for formulating policies for TB control efforts in children.

METHOD

This research was designed as a non-experimental study with an ecological analysis study approach (aggregate study), using report data taken from the "2019 Indonesian Health Profile", which was released by the Indonesian Ministry of Health (Indonesian Ministry of Health, 2019). The ecological analysis is one way for researchers to look at the large-scale impact of a particular policy or intervention on the health of a population in an area (Boskey, 2019). Report data is available on the <http://www.depkes.go.id> page.

This study was conducted with the province as the unit of analysis. A total of 34 provinces in Indonesia were used to analyze this study. The dependent variable as the focus of the study is "Percentage of TB incidence in children in Indonesia." Three groups of independent variables are projected as predictors; the percentage of poverty, the percentage of active integrated healthcare center (Posyandu) in Indonesia, and the percentage of children who are given BCG immunization.

The variable group percentage of the poverty rate consists of people with an average monthly consumption expenditure per capita below the poverty line. Poverty thresholds or levels of expense per capita per month in 2019 is Rp. 425,250.00. The variable group percentage of active integrated healthcare center (Posyandu) in Indonesia consists of integrated healthcare center (Posyandu) that can carry out their main activities regularly every month (KIA: pregnant women, postpartum mothers, infants, toddlers, birth control, immunization, nutrition, prevention, and control of diarrhea) with coverage each - each at least 50% and perform additional activities. The variable group of public places that meet health requirements consists of public places or facilities used for community activities and organized by the government/private sector or individuals, such as public markets, schools, health facilities, terminals, airports, stations, ports, cinemas, hotels, and other public places. The percentage of children receiving BCG immunization is the number of children who have received BCG immunization.

The analysis will be conducted bivariate by entering the independent and dependent variables into the scatter plot. Statistical analysis using Pearson's correlation test (r) is conducted to confirm the relation between the two variables.

RESULT AND DISCUSSION

Table 1. Table of Descriptive Statistics of Analytical TB and Associated Variables

Variable	N	Min	Max	Mean	Std. Deviation
Children Tuberculosis	34	9.6	136.30	46.6735	31.05472
Active integrated healthcare center (Posyandu)	34	0	95.60	54.5765	21.71651
BCG	34	66.4	108.60	91.3882	10.45973
Poverty rate	34	3.6	27.40	10.6176	5.69303

Table 1 shows the disparity in the percentage of child TB occurrence in Indonesia. The province has recorded the lowest percentage of coverage of occurrence is at 9.60%. Meanwhile, the highest percentage of occurrence coverage is achieved by West Java Province which is 136.30%. Then the highest poverty rate is found in Papua province at 27.4% and the lowest poverty rate is in Jakarta at 3.6%. The most active integrated healthcare center (Posyandu) was DKI Jakarta province at 95.6% and the lowest was in the province of West Papua at 0.1%. The lowest coverage of BCG immunization is in the province of Aceh was 66.4% and the highest coverage is in the province of Bali as much as 108.6%.

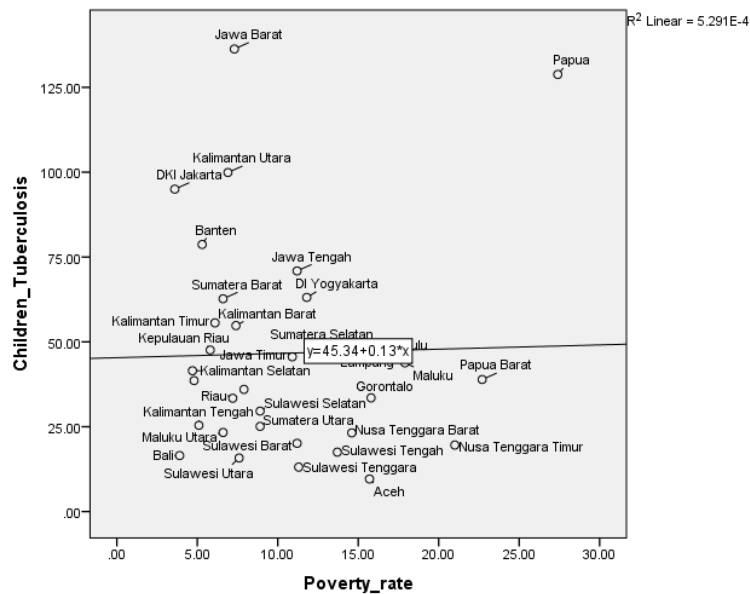


Figure 1. Tuberculosis Scatter Plot in Children and Poverty Rate

Figure 1 shows the incidence of Tuberculosis in children with poverty in Indonesia. In the poverty rate variable, it can be seen that the more poverty rates in a province there is a tendency for the incidence of tuberculosis in children to be higher. The results of the Pearson correlation test between the variable number of poverty rates and the incidence of TB in children showed significant results ($r = 0.023 < 0.05$). This is in line with the research conducted by Sabirin R (2014), which said that poverty was associated with the incidence of pulmonary TB in Indonesia, as proven by the chi-square value of 18,661 with a significant level of $= 0.000 < 0.05$. The results of research conducted by Sihaloho et al., (2020) in 407 regencies and cities in 29 provinces in Indonesia, also show that TB has a positive and significant effect on the number of poor people in Indonesia. According to Tanimura (2014), about 100 million people are at risk of being below the poverty line when they get sick. TB is one of them. This is because TB disease makes the cost of living bigger because of the costs during treatment. In addition, TB will prevent them from working productively.

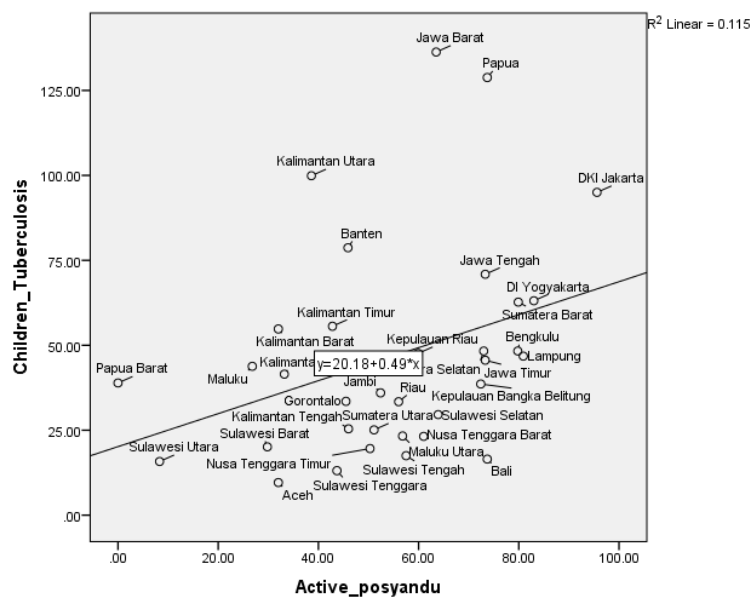


Figure 2. Scatter Plot Tuberculosis in Children and Activity of Integrated Healthcare Center (Posyandu)

Figure 2 shows the distribution of the incidence of tuberculosis in children and the variable percentage of active integrated healthcare center (Posyandu) in Indonesia. In the active integrated healthcare center (Posyandu) variable, it

can be seen that the more active integrated healthcare center (Posyandu) in a province, the higher the TB rate in children. This is also explained by a study conducted by (Triana, 2007) which showed a significant correlation between the level of maternal participation in integrated healthcare center (Posyandu) and the incidence of TB ($p = 0.05$; $r = 0.320$).

Through integrated healthcare center (Posyandu) activities, families, especially mothers, can monitor the child's growth and development process. If based on KMS records health problems are found in children, then mothers can immediately carry out further examinations. The better the participation of mothers in integrated healthcare center (Posyandu), the more likely TB cases in children can be detected early so that it will break the chain of transmission of TB early on. In the study through the Pearson correlation test, significant results were obtained between the number of active integrated healthcare center (Posyandu) variables and the incidence of tuberculosis in children ($r = 0.050 < 0.05$).

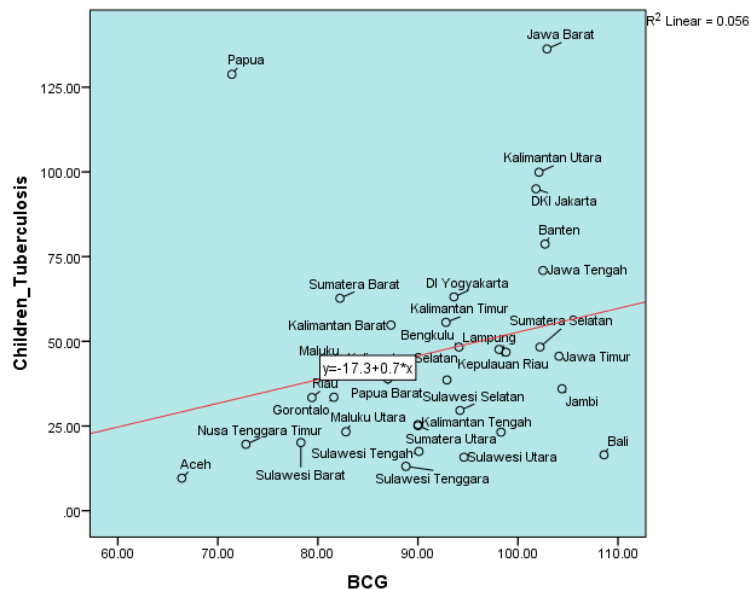


Figure 3. Scatter plot Tuberculosis in children and BCG immunization

Figure 3 shows the distribution of the incidence of tuberculosis in children and the variable percentage of children who received BCG immunization. In the BCG immunization variable, it can be seen that the amount of BCG immunization is directly proportional to the magnitude of the incidence of TB in children, meaning that the higher the incidence of TB in children in the province will be in line with the high number of BCG immunizations given, with the hope that TB cases in children in the masses will decrease. In a study conducted by Rachim, (2014) there was a relationship between the provision of BCG immunization with the incidence of TB in children, BCG can prevent tuberculosis by about 10% in the sample population.

However, a study conducted by Siringoringo (2017) stated that there was no relationship between the administration of BCG immunization and the incidence of pulmonary tuberculosis in children (p value: 0.305) under five at Dr. Pirngadi Medan Hospital. Conclusion: There is no relationship between BCG immunization and the incidence of pulmonary tuberculosis in children under five at Dr. Pirngadi Medan Hospital. Immunization is a procedure to increase the degree of immunity, provide protective immunity by inducing a memory response to certain pathogens or toxins using nonvirulence or nontoxic antigen preparations (vaccines). The BCG vaccine is a vaccine that has been shown to protect children from severe forms of childhood tuberculosis, such as miliary tuberculosis and tuberculous meningitis. But it is not good enough to protect it from adult forms of pulmonary tuberculosis. The level of BCG vaccine protection ability varies between 0-80%, and the protection ability given by BCG vaccine to children under five is also influenced by the condition of the BCG vaccine itself, where BCG vaccine must be stored at 2-8°C. In this study, the results of the Pearson correlation test between the number of immunizations and the incidence of tuberculosis in children showed insignificant results ($r = 0.238 < 0.05$)

CONCLUSION

Based on the results of the scatter plot and bivariate test, it shows that the higher the number of poverty rates, the higher the incidence of TB in children, the more active integrated healthcare center (Posyandu) in an area, the higher the TB incidence in children, and the more children who are immunized with BCG, the higher the incidence of TB in children.

In that area, TB cases in children are also getting higher. It is concluded that the poverty rate and active integrated healthcare center (Posyandu) have a positive relationship, while BCG immunization has a negative relationship with TB incidence in children.

It is recommended that the government formulate special policies on target areas with the highest number of poverty rates and increase the activity of integrated healthcare center (Posyandu) in areas where the achievement of child TB is still low, as well as increase BCG immunization in areas with the most child TB cases to break the chain of transmission in the future.

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