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Risk Factors for Child Tuberculosis in Ambon City in 2019

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Abstract

The percentage of TB globally reaches 6% (530,000 TB patients children/year) while the death of children (with negative HIV status) suffering from TB reaches 74,000 deaths/year or with a percentage of about 8% of the total deaths caused by TB (TB Control Guidelines, 2014). The number of TB cases in children in Ambon City in 2018 was 220 cases in 22 Puskesmas, the highest cases of TB in children were in three Puskesmas including Puskesmas Ch.M. Tiahahu, 16 TB cases in children, Air Salobar Health Center with 5 TB cases for children and Rijali Health Center with 1 TB case for children. This study aims to determine whether BCG immunization, nutritional status, LBW, smoking, and household contacts are risks of TB in children in Ambon City in 2019. This type of research uses retrospective correlation analytical case control studies design that identifies patients and their effects or diseases. certain (cases) and groups without cases. The sample in this study consisted of 22 cases of TB for children under five and 64 controls for children under five. The case sampling technique was the total sampling, the comparison of cases and controls was 1: 2. The results of the analysis based on 95% CI obtained a value of OR = 0.101 with a CI 95% LL - UP 0.010-1.024, nutritional status OR = 1.761 with 95% CI LL - UP 0.524-5.921, LBW OR = 3.492 with 95% CI LL - UP 1,141-10,688, smoking behavior OR value = 0.536 with CI 95% LL - UP 0.189-1.521 and household contacts determine the value OR = 31.00 with CI 95% LL - UP 6.029-159,398.

Introduction

Golobal TB report 2017 TB incidence per 100,000 population in 2018 is 321 per 100,000 population is expected to decrease to 190 per 100,000 population in 2024. Globally in 2016 there were 10.4 million cases of TB incidents (8.8 million - 12 million) which is equivalent to 120 cases per 100,000 population. The five countries with the highest incidence of cases are India, Indonesia, China, the Philippines and Pakistan (Ragonnet et al., 2019). The world health agency defines high burden countries (HBC) for TB based on 3 indicators, namely TBC, TBC/HIV, and MDR-TBC, there are 48 countries included in the list. One country can be included in one of these lists, or both, can even be included in all three, including Indonesia and 13 other countries, are included in the HBC list for the 3 indicators, meaning that Indonesia has a big problem in dealing with TB disease (Global Tuberculosis Report, 2018).

The number of TB cases in children in Ambon City in 2018 was 220 cases in 22 Puskesmas, the highest cases of TB in children were in three Puskesmas including Puskesmas Ch.M.

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Tiahahu as many as 18 TB cases in children, Air Salobar Puskesmas totaled 14 TB cases for children and Puskesmas Rijali totaled 11 TB cases in children (Ambon City Health Office, 2018).

Some determinants of TB transmission in children are among parents' misperceptions about BCG immunization in children, this can be seen by the proportion of immunizations in children aged 12-23 months in 2013-2018 with a percentage of 87.6% for 2013 and 2018 with The percentage of 86.9% shows the amount of BCG immunization coverage in children as a form of special protection as an effort to increase preventive and promotive (Basic Health Research, 2018). In addition, determinants of nutritional status in children are a risk factor for TB among children among the proportion of weight weighing in children under five in 2013 - 2018 who do not meet the standards for the age group 6 - 59 months> 4 times in the last 6 months and for the year 2013 with percentage of 21.1% while in 2018 with a percentage of 40%> 8 months in the last 12 years, in addition to the process of weighing the child's weight, this will increase, this is indicated by the consumption of different foods in children including Indonesia, the proportion of food varies for children 6 - 23 months with the percentage reached 46.6% for the highest proportion in Indonesia, namely DIY 69, 2% Maluku Province consuming various food for children with a percentage of 17.7%. While the proportion of birth weight <2500 grams (LBW) in children aged 0 - 59 months in 2018 Maluku with a percentage of 5.8% in 2018 the national standard with a percentage of 6.2% in 2018 (Basic Health Research, 2018).of epidemiological surveillance of increasing air traffic in Class III Banda Aceh in 2019.

Methods

This type of research uses retrospective analytical case control study design which identifies patients and a specific disease or effect (cases) and the case-free group in this study wants to know whether a certain risk factor really affects the effect under study by comparing the frequency of risk factor exposure. in the case group with frequency in the control group and aims to determine the effect of risk factors (Susila, 2014).

The research locations were Puskesmas Ch.M.Tiahahau, Puskesmas Airsalobar and Puskesmas (Community Health Center) Rijali, and households (RuTa) in the working area of the puskesmas which had been implemented for 1 month.

The population in this study amounted to 86 children, including a case population of 22 children and a control population of 64 children who were registered in the public health center register. For the case population, there are several health centers working areas, including the Ch.M.Tiahahu puskesmas, 16 TB cases in children, Air Salobar Health Center 5 TB cases for children under five and Rijali Puskesmas there are 1 TB cases in children under five, while the control group population is 64 children in all three regions. puskesmas work.

The sample in this study was a case sample of 22 TB cases for children under five and 64 controls for children under five. The case sampling technique was the total sampling, the ratio of cases and controls was 1: 3 (the comparison of control was more due to the small number of cases so that the control was increased).

Results and Discussion

This research lasted for 1 month in three (3) working areas of the health centers which were the research locations, namely Puskesmas Rijali, Puskesmas Valentine and Puskesmas Air Salobor, the results of the research can be seen in the results of the analysis below.

Big risk of history of immunization with the risk of TB in children

Table 1.
Large Risk History of BCG immunization against TB incidence in children
In Ambon City in 2019

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No	History of BCG Immunization	TB Risk				total		p	OR	CI 95% Lower limit – Upper limit
		Cases		Control						
		n	%	n	%	N	%			
1	High Risk	3	13.6	1	1.6	3	3.5	0.05	0.101	0.010-1.024
2	Low Risk	19	86.4	63	98.4	83	96.5			
	Total	22	100	64	100	86	100			

Source: Primary Data

Table 1. shows that the risk analysis of BCG immunization history with TB incidence, namely 22 case groups who did not have a history of BCG immunization as many as 3 people (13.6%) and had a history of BCG immunization as many as 19 people (86.4%) while the control group almost all had a history of immunization. BCG as many as 63 people (98.4%). Based on the risk analysis to determine the value of OR = 0.101 with a 95% CI LL-UP 0.010-1.024 indicating an OR value <1, the history of BCG immunization is a protective (neutral) risk factor for TB incidence in children.

The risk of the nutritional status of children with the risk of child tuberculosis

Table 2.
Big Risk of Child Nutritional Status to incidence of TB in children
In Ambon City in 2019

No	Child Nutritional Status	TB Risk				total		p	OR	CI 95% Lower limit – Upper limit
		Cases		Control						
		n	%	n	%	N	%			
1	High Risk (Malnutrition)	18	81.8	46	71.9	64	74.4	0.52	1.761	0.524-5.921
2	Low Risk (More Nutrition)	4	18.2	18	28.1	22	25.6			
	Total	22	100	64	100	86	100			

Source: Primary Data

Table 2. shows that the risk analysis of nutritional status with the incidence of TB, namely 22 case groups who had malnutrition status were 18 people (81.8%) and had good nutritional stats (more) of 4 people (18.2%) while the control group of 64 people had under nutrition status was 46 people (71.9%) and had good nutritional status (more) as many as 18 people (28.1%). Nutritional status is not a risk factor for TB incidence in children.

The big risk of Low Birth Weight (LBW) with the risk of TB in children

Table 3.
The great risk of child LBW against TB incidence in children
In Ambon City in 2019

No	LBW	TB Risk				total		p	OR	CI 95% Lower limit – Upper limit
		Case		Control						
		n	%	n	%	N	%			
1	High Risk	8	36.4	9	14.1	17	19.8	0.02	3.492	1.141-10.688
2	Low Risk	14	63.6	55	85.9	69	80.2			
	Total	22	100	64	100	86	100			

Source: Primary Data

Table 3. shows that the risk analysis of LBW with TB incidence, namely 22 case groups who had a history of LBW as many as 8 people (36.4%) and did not have a history of LBW as many as 9 people (14.1%) while the Control group of 64 people who had a history of LBW were 9 people. 55 people (14.1%) and no history of LBW as many as 55 people (85.9%) Based on a

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risk analysis to determine the value of OR = 3,492 with 95% CI LL - UP 1,141-10,688 shows an OR> 1, then LBW is a risk factor for TB events in Children. The risk of TB in children who have a LBW birth history is 3.49 times greater when compared to children who do not have LBW birth history.

Big risk of smoking behavior of parents with the risk of TB in children

Table 4.
Big risk of smoking behavior of parents to incidence of TB in children
In Ambon City in 2019

No	Smoking Behaviour	TB Risk				total		p	OR	CI 95% Lower limit – Upper limit
		Case		Control						
		n	%	n	%	N	%			
1	High Risk	14	63.6	49	76.6	63	73.3	0.36	0.536	0.189-1.521
2	Low Risk	8	36.4	15	23.4	23	26.7			
	Total	22	100	64	100	86	100			

Source: Primary Data

Table 4. shows that the analysis of the risk of smoking behavior in parents with TB incidence, namely 22 case group people who have smoking behavior as many as 14 parents (63.6%) and 8 people whose parents do not smoke (36.4%) while the Control group of 64 49 people who have smoking parents (76.6%) and 15 non-smoking parents (23.4%) then the smoking behavior of parents is not a protective factor (neutral) against the incidence of TB in children.

Big risk of household contact with the risk of TB in children

Table 5.
Large risk of household contact against the incidence of TB in children
In Ambon City in 2019

No	House contact	TB Risk				Total		p	OR	95% Lower limit – Upper limit
		Case		Control						
		n	%	n	%	N	%			
1	Risk	11	50.0	2	3.1	13	15.1	0.00	31.00	6.029 -159.398
2	Not Risk	11	50.0	62	96.9	73	84.9			
	Total	22	100	64	100	86	100			

Source: Primary Data

Table 5. shows that the analysis of the risk of household contact with TB incidence is 22 case groups who have household contacts with TB sufferers as many as 11 people (50%) and those who do not have home contact relationships with TB patients are 11 people (50%) while the Control group Out of 64 people who had a history of home contact with TB recipients were 2 people (3.1%) and 62 people who did not have home contact with TB sufferers (96.9%) Based on a risk analysis to determine the value of OR = 31.00 with 95% CI LL-UP 6,029-159,398 shows an OR value <1, so household contact behavior is not a risk factor for the incidence of TB in children. The risk of TB in children with a history of household contacts was 31.00 times greater than in children who had no history of serum contact.

Multivariate Analysis

Three independent variables that have a strong (determinant) effect on the incidence of TB in children sequentially are BCG immunization, LBW and household contact. times more likely to get TB compared with respondents who have a history of BCG immunization. The complete results can be seen in the following table:

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Table. 6. Analysis of risk factors that affect the incidence of child tuberculosis in Ambon City in 2019

Variable	B	SE	DF	Sig	Exp (B)	95% CI For Exp (B)	
						Lower	Upper
LBW	-0.914	0.712	1	0.199	0.401	0.099	1.618
House Contact	-3.275	0.854	1	0.000	0.038	0.007	0.202
BCG Immunization	1.689	1.407	1	0.230	5.414	0.343	85.338
Contanst	0.311	1.405	1	0.825	1.364		

Source: Primary Data

The best model formed from the results of the Logistic Regression test is as follows:

TBCC Logit of Children = 0.311 + 0.914 (LBW) + 3,275 (Domestic Contacts) + 1,689 (Immunization History)

With the above equation, it can be calculated about the probability (risk) of an individual experiencing child tuberculosis, namely:

$$\text{In}\left[\frac{p}{1-p}\right] = a + b_1x_1 + b_2x_2 + \ldots\ldots\ldots\ldots b_kx_k$$

$$P = \frac{1}{1 + e^{-(a+b1\,x1+b2\,x2+\ldots\ldots bk\,xk)}}$$

$$P = \frac{1}{1 + 2.72^{-(0{,}311+0.914\,(0)+(-3.275\,(1)+1.689\,(1)}} = 0{,}44$$

This means that children who are not LBW but live at home with TB sufferers and have a complete immunization history, have a 44% probability of contracting TBCC. If all the variables in the regression function are multiplied by zero, then the lowest probability of experiencing TBCC in children is 31%.

BCG immunization in this study obtained a history of BCG immunization with the incidence of TB, namely 22 people in the case group who did not have a history of BCG immunization as many as 3 people (13.6%) and had a history of BCG immunization as many as 19 people (86.4%) while the control group almost all had a history of immunization. BCG as many as 63 people (98.4%). Based on the risk analysis to determine the value of OR = 0.101 with 95% CI LL-UP 0.010-1.024, it shows an OR value <1, so the history of BCG immunization is a protective (neutral) risk factor for the incidence of tuberculosis in children. The results of this study indicate that almost all children have a history of BCG immunization well, this shows that BCG immunization does not affect the incidence of TB in children. The same results are shown in the study of Fajriah Rosandali et al. p value <0.05

This shows that the body's immunocompotent cells have been completely formed when the baby is born, so giving the BCG vaccine at the time of the baby will cause a better immune response, especially cellular immune response rather than humoral response. Immune response is closely related to the body's ability to fight disease, so the results of the study indicate that immunization will increase the body's resistance to tuberculosis. This study is also in line with research by (Prihanti & Rahmawati, 2017) concerning the analysis of risk factors for pulmonary tuberculosis incidence of BCG immunization history (p = 0.001; OR = 0.048; CI = 0.002-1.308). BCG immunization can increase the body's defense against pulmonary tuberculosis by up to 80% (Chan et al., 2012). However, there are differences in the results of the study stated. The results of this study are not in line with Erni 2007, which states that there is a statistically significant relationship between BCG immunization and the incidence of pulmonary tuberculosis in children, so it can be said that even though the child has received BCG immunization, the child is still potential and can contract Tuberculosis because of adult

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TB transmission or other causes so that the protection effectiveness of the BCG vaccine is not optimal.

Nutritional status based on Body Mass Index (BMI) in this study obtained an analysis of the risk of nutritional status with the incidence of tuberculosis, namely 22 people in the case group who had low nutritional status as many as 18 people (81.8%) and had good nutritional status (more) as many as 4 people (18.2 %) while the control group of 64 people had a poor nutritional status as many as 46 people (71.9%) and had a good nutritional status (more) as many as 18 people (28.1%) Based on a risk analysis to determine the value of OR = 1.761 with 95% CI LL-UP 0.524-5.921 shows the value of OR = 1, then nutritional status is not a risk factor for the incidence of tuberculosis in children.

Only 10% of those infected with TB bacillus will suffer from TB disease. The number of incoming TB bacilli, virulence and endurance of the host body are factors that play a role in the occurrence of TB disease. In patients whose immune system is poor, the immune response is poor, so that germs are easy to develop, but in this study the status of children suffering from malnutrition who suffered from tuberculosis was 18 people (81.4%). affects family income and consumption patterns of families with adequate nutrition. Small family income does not allow for optimal health services. socio-economic improvements, improved living standards and the environment as well as economic progress brought many changes. In developed countries long before the discovery of anti-tuberculosis drugs (tuberculostatics and tuberculosoid) thanks to socio-economic improvements, the number of sufferers decreased 10-15% per year, meaning that TB can disappear by itself if there is economic improvement. Pulmonary tuberculosis is always associated with poverty.WHO (2003), 90% of TB sufferers in the world attack groups with weak or poor socioeconomic conditions and the relationship between the two is reciprocal, where TB disease is the cause of poverty and because of poverty, humans suffer from TB. Families who have a higher income will be better able to maintain the cleanliness of their household environment, provide good drinking water, buy adequate quantities and quality of food for their families, and be able to finance the maintenance of health they need. poor nutrition, unhealthy housing and low access to health services. This research is also supported by research conducted in line with research conducted by Prihanti & Rahmawati (2017) concerning the analysis of risk factors for the incidence of pulmonary tuberculosis BMI (p = 0.002; OR = 8.785; CI = 1.153-66.93)

Risk analysis of LBW with TB incidence, namely 22 case groups who had a history of LBW as many as 9 people (36.4%) and did not have a history of LBW as many as 9 people (14.1%) while the Control group of 64 people who had a history of LBW were 9 people (14.1%) and those who do not have a history of LBW as many as 55 people (85.9%) Based on the risk analysis to determine the value of OR = 3.492 with a CI 95% LL - UP 1.141-10.688 showing an OR value> 1, LBW is a risk factor for TB incidence in children. The risk of TB in children who had a birth history of LBW was 3.49 times greater when compared to children who did not have a birth history of LBW.

The results of this study indicate that in the case group some children were born with low birth weight so that this is in accordance with the policy in Indonesia as a developing country which determines not to vaccinate babies with low birth weight. LBW babies (birth weight less than 2.5 Kg) giving BCG vaccine will fail because the child's immune system is not good. Besides that, the BCG vaccine will not provide 100% protection for children so that children must be kept away from adult TB. This study is different from that conducted by Kholifah & Indreswari (2015) regarding the factors of tuberculosis in children based on a history of home contact that there is no relationship between low birth weight and the incidence of pulmonary tuberculosis in children with p value: 1.00.

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Smoking is an important risk factor for cardiovascular disease and other major causes of death worldwide, namely cerebrovascular, lower respiratory tract infections, COPD, tuberculosis, and airway cancer (Okamura & Morimoto, 2011). Cigarette smoke contains more than 4,500 chemicals that have various toxic, mutagenic and carcinogenic effects. Cigarette smoke produces a variety of components in both the cellular and extracellular compartments, ranging from water and gas soluble particles. Many substances are carcinogenic and toxic to cells but tar and nicotine have been shown to be immunosuppressive by affecting the innate immune response of the host and increasing susceptibility to infection. The higher the tar and nicotine levels the effect on the immune system also increases. The risk of TB can be reduced by nearly two-thirds if a person stops smoking. The results of this study indicate that based on a risk analysis to determine the value of OR = 0.536 with a CI 95% LL-UP 0.189-1.521 shows an OR value <1, the smoking behavior of parents is not a protective factor (neutral) against the incidence of TB in children. The results of this study are in line with that conducted by Sejati & Sofiana (2015) regarding the factors of tuberculosis, smoking habits do not show a relationship using the chi-square test and the fishers exact test (p value 1.00). Smoking in this study is the child's exposure to smoking behavior of parents of children as passive smokers. The results of the study were obtained by most parents smoking, but the smoking area where some parents answered outside the home (smoker's husband) for a long time under the job, so exposure to cigarettes is not directly to the child. Another study whose results were not in line with the research conducted was Prihanti & Rahmawati (2017) regarding risk factor analysis for pulmonary tuberculosis, which stated that smoking was associated with tuberculosis risk events with the results obtained by a history of smoking (p = 0,000; OR = 11,706; CI = 0.746 -183.66).

Based on the latest TB epidemiology data, it is said that currently there are more children with TB in the 5 - <14 years age group because in this age group children already know the world outside the home, so the possibility of having contact with positive adult TB sufferers is greater. In the age group 5 - <14 years, children can play and get to know many people outside their homes, so that children will come into contact with positive adult TB sufferers, which is a major factor in transmitting TB to children. Environmental factors also greatly affect the occurrence of TB in children. Apart from this, physical as a supporting factor, such as a house with good lighting and ventilation, will make it difficult for germs to grow, because ultraviolet rays can kill germs and good ventilation causes air exchange, thereby reducing the concentration of germs. The results obtained%) Based on the risk analysis to determine the value of OR = 31.00 with a 95% CI LL - UP 6.029-159.398 showing an OR value <1, the household contact behavior is not a risk factor for TB incidence in children. In line with the research conducted by Prihanti & Rahmawati (2017) on the analysis of risk factors for pulmonary tuberculosis, it was obtained a history of contact with TB patients (p = 0.004; OR = 13.269; CI = 0.737-238.96).

In addition to contact with BTA + TB in adults in the study, it was also found that occupancy density is a supporting factor for the risk of TB, the number of family members who live in the house is 10-11 people whose physical quality of the house is not in accordance with the requirements of a healthy house. However, the occupancy density is not a variable studied but it is quite important as a determinant of TB in children

Conclusion

The risk of TB incidence in children who have no history of BCG immunization is 0.101 times greater than that of children who have a history of BCG immunization. The risk of TB incidence in children with poor nutritional status is 1,761 times greater than that of children with good nutritional status. The risk of TB incidence in children who are LBW is 3,492 times greater than that of children who are not LBW. The risk of TB incidence in children whose parents smoke behavior is 0.536 times greater than that of children whose parents do not smoke.

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The risk of TB incidence in children who had a history of household contacts was 31.00 times greater than that of children without a history of household contacts. Not having a history of BCG immunization had a 5,414 times greater risk of contracting TB than respondents who had a history of BCG immunization.

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