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Analysis of Risk Factors for Tuberculosis in the Lake Coastal Area, Towuti District, East Luwu Regency, Indonesia

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Abstract: Background: Tuberculosis (TB) is still a global problem. The high incidence of TB is due to the less than optimal TB risk factor interventions. This study aims to analyze the risk factors for TB incidence in the coastal area of the lake, Towuti District, East Luwu Regency.
Methods: This study used a case-control design conducted in the coastal area of the lake, Towuti District, with a sample of 34 cases and 94 controls. Bivariate analysis and logistic regression were used to analyze the risk factors for the incidence of tuberculosis.
Results: The results showed that the significant risk factors for TB incidence were family history (OR = 13,920; 95% CI: 4,36–51,23), household contacts (OR = 3.04; 95% CI: 1.188–7,809), close contact (OR = 8.382; 95% CI: 2.969–24, 852), home ventilation (OR = 14.357; 95% CI: 1.585–669.82), income (OR = 2.609; 95% CI: 1.033–6.675) . Home ventilation is the most dominant risk factor for TB incidence in the coastal area of the lake in Towuti District.
Conclusion: TB disease control strategies based on risk factors need to be implemented in coastal areas.

Keywords :Tuberculosis, risk factors, coastal, Luwu Regency, Indonesia

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1. INTRODUCTION

Tropical diseases are still a global problem. Environmental factors contribute to the high incidence of tropical diseases, such as malaria, dengue hemorrhagic fever, and tuberculosis (TB)[1-3]. The burden of TB disease varies widely between countries, from fewer than five to more than 500 new cases per 100,000 population per year, with a global average of about 130 cases. Three states that contribute two-thirds of total TB cases globally are India (27%), China (9%), and Indonesia4.

Case Detection Rate (CDR), Case Notification Rate (CNR), Success Rate of TB cases in South Sulawesi Province in 2017 were 44.4%, 197 per 100,000 population, and 86.1%, respectively. The three figures are higher than the national figure. This indicator illustrates the tendency for the low level of TB control in South Sulawesi. One of the areas in South Sulawesi with a high number of TB cases in East Luwu Regency. The situation of TB in East Luwu Regency in 2018 is a mortality rate of 3.5%, CDR of 67%, CNR of 140 per 100,000 population, a success rate of 97% distributed in 11 Districts, including in the coastal area of the lake, Towuti District[5].

During the last five years, TB cases did not decrease in the number of instances, and CDR outcomes were still meager. This is probably because the intervention risk factors for TB incidence have not been maximal in specific geographic, demographic, and socio-cultural characteristics. Characteristics of air temperature, humidity, wind speed, and altitude affect the spread of pulmonary TB cases in the lakeside[6]. Serotype detection and mapping in an area can be a strategy to monitor disease transmission[7].

Knowing the TB risk factors will help find TB cases to meet TB elimination targets, especially in endemic areas[8]. Several factors may be a risk of TB disease, including demographic characteristics (age, gender, nutritional status, family role, income level, education level), home environmental factors (ventilation area, occupancy density, lighting intensity, floor type, house humidity, temperature, and wall type), behavior factors (habit of opening windows every morning and smoking habits), and contact history[9].

Based on the background description, the researchers are interested in studying the risk factors for TB incidence in the lake's coastal area, Towuti District, East Luwu Regency.

2. METHODS

Research Location and Design

This research location is located in the coastal area of the lake, Towuti District, East Luwu Regency, South Sulawesi Province. This study uses analytical research methods with a case-control design.

Population and Sample

The case group in this study were residents diagnosed with TB in the coastal lake area of Towuti District, East Luwu Regency, in 2019. The control group was residents who were not diagnosed with TB who were selected from subjects with similar conditions to the case group. The number of TB cases obtained from the person in charge of the TB program at the Puskesmas in the lakeside area of the Towuti District was 34 cases. In this study, the comparison between the case group and the control group was 1: 2, so that the total sample was 102 samples. The sampling technique was carried out by purposive sampling.

Data collection

This study uses primary data and secondary data. Primary research data collection was carried out through interviews. Secondary data in the form of TB incidence data in East Luwu Regency 2018-2019 were obtained from the East Luwu Regency Health Office and the Puskesmas in the lake's coastal area, Towuti District.

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Data analysis

Bivariate analysis using the Odds Ratio (OR) test was conducted to determine the risk factors for each variable on the incidence of TB. To determine the most dominant risk factors for TB incidence, a logistic regression analysis was performed.

3. RESULTS

Table 1 shows that based on the age variable's statistical test results, the OR = 1 (95% CI: 0.329-3.287) was obtained. Lower Limit (LL) and Upper Limit (UL) values include a value of one, so the OR value is not significant. Respondent's age is not a risk factor for TB incidence. The statistical analysis results on the gender variable obtained the value OR = 1 (95% CI: 0.401-2.530. Interpretation of LL and UL values includes a value of one, then the OR value is insignificant. Gender is also not a risk factor for TB incidence in the lakeside area of the Towuti District.

Table 1. Analysis of Risk Factors for TB Incidence in the Lake Towuti Coastal Area

Research variable	**Incidence of Tuberculosis (TB)**				**Total**		**OR** ***p-value***	**CI 95%**
	Yes		**No**					
	n	**%**	**n**	**%**	**n**	**%**		
Age								
Productive	27	79,4	54	79,4	81	79,4	OR=1	0,329-3,288
Not productive	7	20,6	14	20,6	21	20,6	*p*=1	
Gender								
Male	20	58,8	40	58,8	60	58,8	OR=1	0,401-2,530
Female	14	41,2	28	41,2	42	41,2	*p*=1	
Family History								
There is	29	85,3	20	29,4	49	48,0	OR=13,92	4,357-51,231
There is no	5	14,7	48	70,6	53	51,9	*p*=0,000*	
Home Contact								
There is	15	44,1	52	76,5	67	65,7	OR=4,116	1.564-10,869
There is no	19	55,8	16	23,5	35	34,3	*p*=0,001*	
Close contact								
There is	26	76,5	19	27,9	45	44,1	OR=8,382	2,969-24,852
There is no	8	23,5	49	72,1	57	55,9	*p*=0,000*	
Home Ventilation								
Not eligible	6	17,7	1	1,47	7	6,9	OR=14,35	1,585-669,82
Eligible	28	82,3	67	98,5	95	93,1	*p*=0,002*	
Income								
< UMK	21	61,8	26	38,2	47	46,1	OR=2,609	1,033-6,676
≥ UMK	13	38,2	42	61,8	55	53,9	*p*=0,025*	
Knowledge level								
Less	6	17,7	5	7,4	11	10,8	OR=2,70	0.622-12,069
Enough	28	82,3	63	92,6	91	89,2	*p*=0,114*	

The statistical analysis results on the family history variable showed that the OR = 13.92 (95% CI: 4.3571-51.23). Because the LL and UL values do not include number 1, there is a significant relationship between family history and the incidence of TB in the lakeside

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area of the Towuti District with a considerable risk of 13.9. This means that respondents who have a family history of TB have a 13.9 times greater risk of suffering from TB disease than respondents who do not have a family history of TB.

The household contact variable's statistical test results obtained the value OR = 4.116 (95% CUI: 1.564 - 10.869). Since LL and UL do not include a value of one, family history has a significant effect on TB incidence. As for the close contact variable's statistical results, the OR = 8.381 (95% CI: 2.968 - 24.852) was obtained. Because LL and UL do not include a value of one, close contact has a significant effect on TB incidence.

The statistical test results of the odds ratio (OR) on the home ventilation variable obtained the OR = 14.357 (95% CI: 1.585-669.82). Because LL and UL do not cover the value of one, home ventilation has a significant effect on the incidence of TB in the coastal lake area of the Towuti District.

The odds ratio (OR) statistical test results on the income variable obtained the OR = 2.609 (95% CI: 1.033-6.676). Since LL and UL do not cover the value of one, income has a significant effect on tuberculosis incidence.

In addition to the seven previous variables, this study also carried out a statistical test analysis on the knowledge level variable, namely the OR = 2.70 obtained with 95% CI: 0.621 - 12.069. Because LL and UL cover a value of one, knowledge is not a risk factor for TB incidence in the lakeside area of the Towuti District.

Table 2. The results of multivariate analysis of the incidence of tuberculosis in the lakeside of Towuti District

Variabel	**Odds Ratio**	**Std.error**	**Z**	**p>|z|**	**95% Conf. Interval**	
					LL	**UL**
Family history	8.875819	5.612935	3.45	0.001	2.56993	30.65459
Close contact	6.534392	3.974602	3.09	0.002	1.983601	21.52564
Ventilation	37.85728	51.01196	2.70	0.007	2.698805	531.04
Constant	**0.2783445**	**0.1556325**	**-2.29**	**0.022**	**0.0930347**	**0.832761**

Table 2 shows that the most dominant or most influential variable on the incidence of tuberculosis on the lake's shore is the home ventilation variable with an OR = 37.857 (95% CI: 2,699 - 531.04). The statistical test value shows that the home ventilation variable has a significant risk of tuberculosis incidence of 37,857 times.

4. DISCUSSION

Age is one of the risk factors that cause TB disease, especially in the productive age between 15-59. In this study, age was not a risk factor for TB incidence. This is presumably due to the easy and fast rate of TB disease transmission. In the coastal area of the Lake Towuti District, TB sufferers are those who have a family history of TB, so that person-to-person transmission is possible without categorizing their age. This study is in line with the research of Fransiska and Hartati, who stated that the number of respondents who were less than 15 years old or more than 65 years old experienced TB disease because the transmission rate of TB disease depends on the number of tuberculosis bacilli in a person's sputum, so this disease is very easily transmitted either from the age they are still babies, toddlers, old or young[10].

Furthermore, on the gender variable, this study's results also indicate that gender is not a risk factor for TB incidence. Ekaprasetia obtained similar results in her research; namely, there was no relationship between the sex of the patient and the incidence of TB. The absence of a relationship between sex and the incidence of TB is suspected because the proportion

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between men and women who were respondents in this study was almost the same. Also, the role of women is currently doing many activities outside the home so that contact with TB sufferers has also increased[11].

The family is the person who interacts most frequently with sufferers so that they are at greater risk of contracting TB if there are family members who are affected by the disease. This study indicates that respondents who have a family history of TB have a risk of suffering from TB 13.920 times compared to respondents who do not have a family history of TB. The same result was found in Yan's study, which found that a family history of TB was a risk factor for coal workers[12].

This study indicates that respondents who have household contacts have a 4.116 times greater risk than respondents who do not have household contacts. Every single smear-positive will infect 10-15 other people, so the likelihood of each contact contracting TB is 17%. This study's results are in line with Widoyono's research, which reported that the closest connection (household) would be twice as risky as regular contact (not at home) [13].

Close contact in social interaction is a relationship seen from individuals and social groups, where they meet each other regularly without wearing masks or covering their mouths, causing infection. The study results found that respondents who had a tight box with TB sufferers had a risk of TB infection 8.382 times than those who did not have close contact. Close contact in the form of social interaction that occurs on the coast of Lake Towuti, Towuti District in 2020, generally has a business pattern that can be seen from the relationship of cooperation in carrying out activities. When interacting indoors or outdoors, they are reluctant to cover their mouths for those who cough, and those who don't are reluctant to leave. This study's results are in line with the research of Apriliasari, Hestiningsih, Martini, & Udiyono, which showed that close contact is a risk factor for TB disease[14].

In this study, income is also a risk factor for TB incidence in the coastal areas of the lake, Towuti District. TB problems are closely related to socio-economic aspects. Poverty or low socio-economic conditions can cause weaknesses in families to meet nutritional food needs. Low socio-economic conditions are also usually identified with a slum environment where many diseases develop, one of which is tuberculosis[15]. The level of knowledge is also not a risk factor for TB incidence in Lake Towuti District's coastal communities. A person's high level of expertise can lead to changes in perceptions, habits, and behavior[16] This study is in line with Ihram's research, which stated that knowledge was not related to the incidence of pulmonary TB. This could explain that experience is not a determining factor for TB incidence[17].

Based on multivariate analysis, the factor most at risk for TB incidence is home ventilation. A house is a place for the most extended family interaction. The room and air circulation area is significant to determine the health of a house and can also be a medium for the development of a disease. A good or healthy home must have adequate ventilation to prevent the growth or proliferation of pathogenic bacteria such as Mycobacterium tuberculosis[18,19].

5. CONCLUSION

The results showed that the significant risk factors for TB incidence in the coastal area of Lake Towuti District were family history, household contact, close contact, home ventilation, and income. Home ventilation is the most dominant risk factor for TB incidence in the coastal area of the lake, Towuti District, East Luwu Regency. Therefore, TB disease control strategies based on risk factors need to be implemented in coastal areas.

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