



Risk Factors of Pulmonary Tuberculosis in the Working Area of Kotaraja Public Health Center of Jayapura City, Papua Province

Anneke Yacob^{a*}, AL Rantetampang^b, Yermia Msen^c, Yacob Ruru^d

^a*The Magister Program, Faculty of Public Health, Cenderawasih University, Jayapura Papua 99351, Indonesia*

^{b,c,d}*Faculty of Public Health, Cenderawasih University, Jayapura Papua 99351, Indonesia*

^a*Email: ikke.anneke93@gmail.com*

Abstract

Tuberculosis is still a major problem in the health of the Indonesian people. Pulmonary tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis*. The main symptom is coughing for 3 weeks or more. It is estimated that the number of Tuberculosis patients in Indonesia is around 10% of the total number of Tuberculosis patients in the world. Indonesia is ranked second after India with the highest incidence of pulmonary tuberculosis in the world. The purpose of this study was to determine the factors that influence the incidence of pulmonary tuberculosis in Kotaraja Public Health Center of Jayapura City, Papua Province.

The research method used in this study was observational analytic with a case control study approach. A sample of 66 people consisted of 22 people with a diagnosis of pulmonary tuberculosis as a case and 44 people who were not sick with pulmonary tuberculosis as a control. The study was conducted in October 2018. Statistical tests used in this study were univariate, bivariate, and multivariate analysis. Data obtained using questionnaires and interviews.

* Corresponding author.

Bivariate analysis showed several risk factors affecting the incidence of pulmonary tuberculosis in Kotaraja Public Health Center of Jayapura City were age ($p = 0.040$; OR = 0.175; 95% CI = 0.036-0,848), occupation ($p = 0.012$; OR = 0.214; 95% CI = 0.070-0,688), history of pulmonary TB in the family ($p = 0,000$; OR = 13,571; 95% CI = 3,438-53,568), smoking habits ($p = 0,008$; OR = 4,911; 95% CI = 1,628–14,817), and alcohol drinking habits ($p = 0,001$; OR = 7,268; 95% CI = 2,328–22,805), while gender ($p = 0.136$; OR = 0.396; 95% CI = 0.139-1129), education level ($p = 1,000$; OR = 0.908; 95% CI = 0.315-2619), knowledge ($p = 0.057$; OR = 0.267); 95% CI = 0.078-0,917), and history of DM ($p = 0.869$; OR = 0.476; 95% CI = 0.050-4.536) were not influencing to the incidence of pulmonary Tuberculosis. The dominant risk factors were the history TB in the family, smoking habits, alcohol drinking habits, occupation, and age.

Keywords: Pulmonary Tuberculosis; Public Health Center; Case Control.

1. Introduction

Pulmonary tuberculosis is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*. The main symptoms are coughing for 2 weeks or more, accompanied by additional symptoms of phlegm, sputum mixed with blood, shortness of breath, body weakness, decreased appetite, weight loss, malaise, night sweats without physical activity, fever more than 1 month [1]. According to the World Health Organization (WHO), tuberculosis (TB) is one of the 9th highest causes of death globally. In 2011, there were around 8.7 million TB cases globally and 1.4 million people died of TB [2]. In 2016, there was an increase to 10.4 million cases, with an estimated 1.3 million deaths from TB and with an additional 340,000 deaths due to TB-HIV / AIDS infection. In the world there are 22 countries with the highest number of TB cases, and 22 of these are referred to as high burden countries [3].

Indonesia is one of the countries that are among the high burden countries [2,3]. In 2014, it was estimated that there were around 9.6 million new cases of pulmonary TB (5.4 million men, 3.2 million women and 1 million children), but only around 6 million were reported to the World Health Organization WHO. It is estimated that there are 1.5 million deaths from TB, 0.4 million of them due to HIV positive co-infection [4]. In 2016, of the estimated 10.4 million infected, there were 90% of adults, 65% of men, and 10% due to co-infection [3]. TB can be prevented and cured, therefore early detection and effective treatment is needed to break the chain of transmission. In 2015, Indonesia ranks second with the highest TB cases in the world, after India. The estimated TB prevalence in all cases is 1,600,000 cases and the estimated incidence is 1,000,000 new cases per year. The number of deaths from TB is estimated at 100,000 deaths per year [4]. In 2017, WHO estimates the number of TB cases in Indonesia is 1,020,000 cases or 391 per 100,000 population. Death due to TB is estimated at 110,000 with a mortality rate of 42 per 100,000 population.

In 2017, the estimated number of cases in the Papua Province amounted to 15,023 and the number of cases found only reached 10,287 cases (68%), with the number of new cases amounting to 9,992 cases (96%) and 355 cases (3%) as repeat treatment [5]. The Kotaraja Health Center report in 2017 noted that there were 192 people with pulmonary TB and in 2017 there were 207 people, this indicates that there was an increase in cases of 7.81% [6]. Pulmonary tubularosis events can be influenced by several factors, namely age, sex, occupation,

level of education, knowledge, history of TB in the family, smoking habits, drinking habits, and history of diabetes mellitus. Based on this background, the researcher analyzed the risk factors for the incidence of pulmonary tuberculosis in the working area of Kotaraja Public Health Center, Jayapura City, Papua Province.

2. Materials and Methods

2.1. Type of Research

This type of research used in this study was observational analytic with a case control design, where the risk factors studied using retrospective approach. Case is characteristic of subjects with a positive effect, while the control is subject to the characteristics of the negative effects. A case-control study is the type of research design that is widely used, often in epidemiology. This is the kind of observational study in which two groups were not different in the results were identified and compared on the basis of some attribute causal. Case-control studies are often used to identify the factors that can lead to a medical condition by comparing subjects who have the condition / disease (the 'cases') with patients who did not have the condition / disease but is otherwise similar ('controls'). In this study, the cases were patients with pulmonary, while controls were other patients who have non- pulmonary tuberculosis.

The samples in this study were divided into two parts, namely samples for cases and samples for control. For a sample of the "case" will be taken throughout the pulmonary tuberculosis patients who were register in Kotaraja Public Health Center, as many as 22 patients. Next to the "control" will be taken at a convenience sampling of TB patients other than pulmonary tuberculosis by comparing cases and controls was 1: 2 without matching. All of the selected sample included in this study except that reject or do not sign the informed consent.

2.2. Ethical Research and Data Collection

Each respondent was asked to sign an informed consent. Primary data was collected by conducting interviews directly to the sample using interview guideline (questionnaire). Data processing was performed using a computer with the help of SPSS program packages. Data were analyzed using chi-square and binary logistic regression.

3. Result and Discussion

3.1. Univariate Analysis

Univariate analysis is an analysis of each variable to describe the results of the study. This analysis only displays the frequency and percentage of each variable. Results of univariate analysis of variables as seen in table 1: Table 1 shows that out of 66 respondents, male sex as many as 37 people (56.1%), age \geq 33 years old as many as 48 people (72.7%), Protestant Christianity as many as 37 people (56.1%), non-Papuan tribes as many as 36 people (54.5%), higher education as many as 41 people (62.1%), unemployed as many as 45 people (68.2%), good knowledge as many as 42 people (63.6%), has history of TB in the family as many as 36 people (54.5%), has no history of DM as many as 61 people (92.4%), not smoking as many as 43 people (65.2%), not drinking alcohol as many as 43 people (65.2%), and non pulmonary tuberculosis as many as 44 (66.7%).

Table 1: Distribution of respondents according to Gender, Age, Education Level, Occupation, Knowledge, Family History of TB, History of DM, Smoking History, History of Drinking Alcohol, and Incidence of Pulmonary TB in Kotaraja Public Health Center, Jayapura City

| No | Variable | Frequency (n) | Percentage (%) |
|-------|-----------------------------------|------------------|-------------------|
| 1 | Sex | | |
| | Male | 37 | 56.1 |
| | Female | 29 | 43.9 |
| 2 | Age | | |
| | < 33 year | 18 | 27.3 |
| | ≥ 33 year | 48 | 72.7 |
| 3 | Education | | |
| | Low | 25 | 37.9 |
| | High | 41 | 62.1 |
| 4 | Occupation | | |
| | Working | 34 | 51.5 |
| | Not working | 32 | 48.5 |
| 5 | Knowledge | | |
| | Weak | 24 | 36.4 |
| | Good | 42 | 63.6 |
| 6 | History of TB in the family | | |
| | Exist | 36 | 54.5 |
| | Not exist | 30 | 45.5 |
| 7 | History of Diabetes Mellitus (DM) | | |
| | Exist | 5 | 7.6 |
| | Not Exist | 61 | 92.4 |
| 8 | History of smoking | | |
| | Smoking | 23 | 34.8 |
| | Not smoking | 43 | 65.2 |
| 9 | History of drinking alcohol | | |
| | Drinking | 23 | 34.8 |
| | Not drinking | 43 | 65.2 |
| 10 | The incidence of pulmonary TB | | |
| | Pulmonary TB | 22 | 33,3 |
| | Non pulmonary TB | 44 | 66,7 |
| Total | | 66 | 100 |

Source: Primary Data, 2018

3.2. Bivariate Analysis

Bivariate analysis was carried out to determine the risk factors for independent variables, namely gender, age, education level, occupation, knowledge, family history of TB, history of diabetes, smoking history, and history of drinking alcohol on the dependent variable (pulmonary TB incidence). To find out the risk factors for TB incidence, the chi-square test was used with a significance of 5%. The results of the bivariate analysis of the research on the risk factors for pulmonary TB incidence in the working area of Kotaraja Public Health Center are presented in the following tables:

a. Relationship sex with pulmonary tuberculosis incidence

Table 2 shows that out of 22 pulmonary TB patients, 9 people (40.9%) were male and 13 (59.1%) were female. While from 44 patients non-pulmonary TB, 28 people (63.6%) were male and 16 people (36.4%) were women. This shows that in the case group, the proportion of women is greater than that of men, whereas in the control group, the proportion of men is more than women.

Tabel 2: Distribution of sex and pulmonary TB incidence in the working area of Kotaraja Public Health Center of Jayapura city

| Sex | Pulmonary TB incidence | | | | Total | |
|--------|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | n | % |
| | n | % | n | % | | |
| Male | 9 | 40.9 | 28 | 63.6 | 37 | 56.1 |
| Female | 13 | 59.1 | 16 | 36.4 | 29 | 43.9 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |

p=0.136; OR=0,396; 95%CI (0.139–1.129)

Source: Primary Data, 2018

The statistical test results obtained by OR of 0.396 and 95% CI (0.139–1.129) shows that gender is not a risk factor for the incidence of pulmonary TB. The 95% CI of OR that includes a value of 1, indicates that gender is not a significant risk factor for the incidence of pulmonary TB in the Kotaraja Public Health Center of Jayapura city.

b. Relationship age with pulmonary tuberculosis incidence

Table 3 shows that out of 22 pulmonary TB patients, 2 people (9.1%) were <33 years old and 20 people (90.9%) were ≥ 33 years old. While from 44 patients non-pulmonary TB, 18 people (36.4%) were <33 years old and 28 people (63.6%) were ≥ 33 years old. This shows that in the case group, the proportion of respondents aged ≥ 33 years was greater than those aged <33 years, while in the control group, the proportion of respondents aged ≥ 33 years was also higher than those aged <33 years.

Tabel 3: Distribution of age and pulmonary TB incidence in the working area of Kotaraja Public Health Center of Jayapura city

| Age | Pulmonary TB incidence | | | | Total | |
|----------------|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | n | % |
| | n | % | n | % | | |
| < 33 years old | 2 | 9.1 | 16 | 36.4 | 18 | 27.3 |
| ≥ 33 years old | 20 | 90.9 | 28 | 63.6 | 48 | 72.7 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |

p=0.040; OR=0,175; 95%CI (0.036–0.848)

Source: Primary Data, 2018

The statistical test results obtained by OR of 0.175 and 95% CI (0.036–0.848) shows that age was a protective factor in the incidence of pulmonary TB. Since, the value of 95% CI of OR does not include the value of 1, then age is a significant protective factor in the incidence of pulmonary TB in the working area of Kotaraja Public Health Center in Jayapura city. The value of OR=0.175 means that respondents aged <33 years have a risk of 0.175 times exposed to pulmonary TB compared to those aged ≥ 33 years. In other words, there is an influence of age on the incidence of pulmonary TB in the working area of Kotaraja Public Health Center in Jayapura city.

c. Relationship education level with pulmonary tuberculosis incidence

Table 4 shows that of 22 pulmonary TB patients, 8 people (36.4%) were low educated and 14 people (63.6%) were highly educated. While from 44 patients non-pulmonary TB, 17 people (38.6%) had low education and 27 people (61.4%) were highly educated. This shows that in the case group, the proportion of respondents with low education was less than those with higher education, while in the control group, the proportion of respondents with low education was also less than those with higher education.

Tabel 4: Distribution of education level and pulmonary TB incidence in the working area of Kotaraja Public Health Center in Jayapura city

| Education level | Pulmonary TB incidence | | | | Total | |
|-----------------|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | n | % |
| | n | % | n | % | | |
| Low | 8 | 36.4 | 17 | 38.6 | 25 | 37.9 |
| High | 14 | 63.6 | 27 | 61.4 | 41 | 62.1 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |

p=1,000; OR=0,908; 95%CI (0.315–2,619)

Source: Primary Data, 2018

The statistical test results obtained by OR of 0.908 and 95% CI (0.315-2.619) shows that the level of education was not a risk factor for the incidence of pulmonary TB. The OR value of 0.908 means that there is no influence on the level of education on the incidence of pulmonary TB in the working area of Kotaraja Public Health Center in Jayapura city.

d. Relationship occupation with pulmonary tuberculosis incidence

Table 5 shows that out of 22 pulmonary TB patients, 6 people (27.3%) worked and 16 people (72.7%) did not work. While from 44 patients non-pulmonary TB, 28 people (63.6%) worked and 16 people (36.4%) did not work. This shows that in the case group, the proportion of respondents who worked less than those who did not work, on the contrary in the control group, the proportion of respondents who worked more than those who did not work.

Tabel 5: Distribution of occupation and pulmonary TB incidence in the working area of Kotaraja Public Health Center in Jayapura city

| Occupation | Pulmonary TB incidence | | | | Total | |
|---------------|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | n | % |
| | n | % | n | % | | |
| Work | 6 | 27.3 | 28 | 63.6 | 34 | 51.5 |
| Does not work | 16 | 72.7 | 16 | 36.4 | 32 | 48.5 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |

p=0.012; OR=0,214; 95%CI (0.070–0,658)

Source: Primary Data, 2018

The statistical test results obtained OR of 0.214 and 95% of CI (0.070-0.658) shows that occupation was a protective factor in the incidence of pulmonary TB. Since, the value of 95% CI of OR does not include the value of 1, then the occupation is a significant protective factor for the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura city. The OR of 0.214 means that respondents who worked had tended to be infected with pulmonary TB 0.214 times lower than respondents who did not work.

e. Relationship knowledge with pulmonary tuberculosis incidence

Table 6 shows that of 22 pulmonary TB patients, 4 people (18.2%) lacked knowledge and 18 people (81.8%) good knowledge. While from 44 patients non-pulmonary TB, 20 people (45.5%) lack knowledge and 24 people (54.5%) good knowledge. This shows that in the case group, the proportion of respondents with lack knowledge less compared to those with good knowledge, meanwhile in the control group, the proportion of respondents with lack knowledge was less than those with good knowledge

Tabel 6: Distribution of knowledge and pulmonary TB incidence in the working area of Kotaraja Public Health Center in Jayapura city

| Knowledge | Pulmonary TB incidence | | | | Total | |
|-----------|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | N | % |
| | n | % | n | % | | |
| Lack | 4 | 18.2 | 20 | 45.5 | 24 | 36.4 |
| Good | 18 | 81.8 | 24 | 54.5 | 42 | 63.6 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |

p=0.057; OR=0,267; 95%CI (0.078–0,917)

Source: Primary Data, 2018

The results of statistical tests obtained OR at 0.267 and 95% CI (0.078-0.917) indicating that knowledge is a protective factor in the incidence of pulmonary TB. The OR 95% CI value does not cover the value of 1, then knowledge is a significant protective factor in the incidence of pulmonary TB in the Kotaraja Health Center in Jayapura. The value of $p = 0.057$ and OR of 0.267 means that there is no effect of knowledge on the incidence of pulmonary TB.

f. Relationship the history of TB in the family with pulmonary tuberculosis incidence

Table 7 shows that out of 22 pulmonary TB patients, 19 people (86.4%) stated that there was a history of TB in the family and 3 people (13.6%) who stated that there was no history of TB in the family. While of 44 patients non-pulmonary TB, 14 people (31.8%) stated that there was a history of TB in the family and 30 people (68.2%) stated that there was no history of TB in the family. This shows that in the case group, the proportion of respondents who state that there was a history of TB in the family was greater than those who state that there was no history of TB in the family. Meanwhile in the control group, the proportion of respondents who state that there was a history of TB in the family was less than those who state that there was no history of TB in the family.

Tabel 7: Distribution of the history of TB in the family and pulmonary TB incidence in the working area of Kotaraja Public Health Center in Jayapura city

| The history of TB in the family | Pulmonary TB incidence | | | | Total | |
|---------------------------------|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | n | % |
| | n | % | n | % | | |
| Exist | 19 | 86.4 | 14 | 31.8 | 36 | 54.5 |
| Not exist | 3 | 13.6 | 30 | 68.2 | 30 | 45.5 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |

p=0.000; OR=13,571; 95%CI (3,438-53,568)

Source: Primary Data, 2018

The results of the statistical test obtained an OR of 13,571 and 95% CI (3,438-53,568) indicating that the history of TB in the family was a risk factor for the incidence of pulmonary TB. The OR 95% CI value does not cover the value of 1, indicating that the history of family TB is a significant risk factor for the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura city. The OR of 13,571 shows that respondents who have a history of TB in the family have a tendency to be exposed to pulmonary TB 13,571 times higher than respondents who have no history of TB in the family.

g. Relationship the history DM with pulmonary tuberculosis incidence

Table 8 shows that out of 22 pulmonary TB patients, 1 person (4.5%) had a history of DM and 21 people (95.5%) had no history of DM. While from 44 patients non-pulmonary TB, 4 people (9.1%) had a history of DM and 40 people (90.9%) had no history of DM. This shows that both in the case group and in the control group, the proportion of respondents who have a history of DM is less than the respondents who have no history of DM.

Table 8: Distribution of the history DM and pulmonary TB incidence in the working area of Kotaraja Public Health Center in Jayapura city

| The history of DM | Pulmonary TB incidence | | | | Total | |
|---|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | n | % |
| | N | % | n | % | | |
| Exist | 1 | 4.5 | 4 | 9.1 | 5 | 7.6 |
| Not exist | 21 | 95.5 | 40 | 90.9 | 61 | 92.4 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |
| <i>p=0.869; OR=0,476; 95%CI (0.050–4,536)</i> | | | | | | |

Source: Primary Data, 2018

The results of the statistical test obtained OR at 0.476 and 95% CI (0.050–4.536) indicating that the history of DM was not a risk factor for the incidence of pulmonary TB. The OR 95% CI value includes 1, indicating that the history of DM is not a significant risk factor for the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura city.

h. Relationship the history smoking with pulmonary tuberculosis incidence

Table 9 shows that of 22 pulmonary TB patients, 13 people (59.1%) smoked and 9 people (40.9%) did not smoke. While from 44 patients non-pulmonary TB, 10 people (22.7%) smoked and 34 people (77.3%) did not smoke. This shows that in the case group, the proportion of respondents who smoke more than non-smoking respondents, on the other hand in the control group, the proportion of respondents who smoke less than non-smoking respondents.

Tabel 9: Distribution of the history of smoking and pulmonary TB incidence in the working area of Kotaraja Public Health Center in Jayapura city

| The history of smoking | Pulmonary TB incidence | | | | Total | |
|------------------------|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | | |
| | n | % | n | % | n | % |
| Smoke | 13 | 59.1 | 10 | 22.7 | 23 | 34.8 |
| Not smoke | 9 | 40.9 | 34 | 77.3 | 43 | 65.2 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |

p=0.008; OR=4.911; 95%CI (1.628–14,817)

Source: Primary Data, 2018

The results of statistical tests obtained an OR of 4.911 and 95% CI (1,628–14,817) indicating that smoking was a risk factor for the incidence of pulmonary TB. The OR 95% CI value does not cover the value of 1, so smoking is a significant risk factor for the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura city. OR of 4.911 indicates that respondents who smoke have a tendency to be exposed to pulmonary TB 4.911 times higher than respondents who do not smoke.

i. Relationship the history of drinking alcohol with pulmonary tuberculosis incidence

Table 10 shows that out of 22 pulmonary TB patients, 15 people (68.2%) drank alcohol and 7 people (31.8%) did not drink alcohol. While from 44 patients non-pulmonary TB, 10 people (22.7%) drank alcohol and 34 people (77.3%) did not drink alcohol. This shows that in the case group, the proportion of respondents who drank alcohol more than the respondents who did not drink alcohol, on the contrary in the control group, the proportion of respondents who drank alcohol was less than the respondents who did not drink alcohol.

Tabel 10: Distribution of the history of drinking alcohol and pulmonary TB incidence in the working area of Kotaraja Public Health Center in Jayapura city

| History of drinking alcohol | Pulmonary TB incidence | | | | Total | |
|-----------------------------|------------------------|-------|---------|-------|-------|-------|
| | Case | | Control | | | |
| | n | % | n | % | n | % |
| Drink | 15 | 68.2 | 10 | 22.7 | 23 | 34.8 |
| Not drink | 7 | 31.8 | 34 | 77.3 | 43 | 65.2 |
| Total | 22 | 100.0 | 44 | 100.0 | 66 | 100.0 |

p=0.001; OR=7,268; 95%CI (2,328–22,805)

Source: Primary Data, 2018

The statistical test results obtained OR at 7.268 and 95% CI (2,328-22,805) showed that drinking alcohol was a risk factor for the incidence of pulmonary TB. The OR 95% CI value does not cover the value of 1, so drinking

alcohol is a significant risk factor for the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura city. The OR value of 7.268 shows that respondents who drank alcohol had a tendency to be affected by pulmonary TB 7.268 times higher than respondents who did not drink alcohol.

3.3. Multivariate Analysis

Multivariate analysis used in this study is multiple logistic regression. This analysis is a mathematical model used to study the relationship between one or several independent variables with one dichotomous dependent variable (Dahlan, 2012). This analysis is intended to determine the most dominant risk factors for the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura city. The results of multivariate analysis can be seen in table 11.

Tabel 11: The results of Multiple Logistic Regression Analysis with Stepwise Backward LR Method between Independent Variables on Pulmonary TB Occurrence in Kotaraja Public Health Center Jayapura City

| Covariate | B | Wald | p | OR | 95%CI | |
|---------------------------------|--------|-------|------|---------|-------|---------|
| The history of TB in the family | 5.876 | 7.371 | .007 | 356.275 | 5.125 | 2.477E4 |
| The history of smoking | 4.932 | 5.696 | .017 | 138.600 | 2.415 | 7.955E3 |
| History of drinking alcohol | 3.774 | 4.112 | .043 | 43.540 | 1.134 | 1.671E3 |
| Occupation | -4.660 | 7.279 | .007 | .009 | .000 | .279 |
| Age | -7.647 | 5.963 | .015 | .000 | .000 | .221 |

Source: Primary Data, 2018

Based on the results of multiple logistic regression analysis, the dominant risk factors that influence the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura city are the history of TB in the family, the history smoking, the history of drinking, occupation and age.

4. Discussion

4.1. Gender Risk Factors for the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

In this study, the results of statistical tests obtained ORs of 0.396 and 95% CI (0.139–1.129) indicating that gender was not a risk factor for the incidence of pulmonary TB in the Kotaraja Community Health Center in Jayapura, Papua Province. There is a greater proportion of men (56.1%) compared to women (43.9%).

This study is in accordance with the research of Wijanarko and his colleagues [7] shows that there is no meaningful relationship between sex and incidence Pulmonary TB with $p = 0.697$. However, this study is inversely proportional to the research conducted by Elisa and his colleagues [8] which shows that there is a

significant relationship between sex and the incidence of pulmonary TB. This study shows that men are more likely to suffer from pulmonary TB compared to women with $p = 0.01$.

Patients with pulmonary TB tend to be higher in men than women. According to Hiswani, who was quoted from the WHO for at least a period of around 1 million women who died from pulmonary TB, it can be concluded that more deaths were caused by women due to pulmonary TB compared to the consequences of the process of pregnancy and childbirth. In male sex this disease is higher because of smoking tobacco and drinking alcohol so that it can reduce the body's defense system, making it easier to be exposed to agents causing pulmonary TB [9].

In a study conducted by Oktavia and his colleagues [10] stated that gender was not related to the incidence of pulmonary TB ($p = 0.80$; OR = 0.78 (95% CI 0.3-2.06). respondents affected by pulmonary TB between sexes were as large as between the case group (54%) and the control group (45.5%) did not show a significant difference between the two. People with male sex can reduce the risk of developing pulmonary TB by 0.78 times (21%) compared to people of female sex. In populations with a 95% confidence level, men of male sex reduce their risk of developing pulmonary TB by 0.3 times to 2.06 times (70% to 200.94%). In conclusion, the p-value is $0.80 > \alpha 0.05$, meaning that there is no statistically significant relationship between sex and the incidence of pulmonary TB.

Susilayanti's research [11] also found that of the 1,109 research subjects studied were positive smear pulmonary TB patients in BP4 Lubuk Alung, more were male 784 people (70.8%) compared to 324 women (29, 2%), with a ratio of 2.4: 1.

Similar to previous research results in 2007 at BP4 Lubuk Alung, there were more men, 70% and 30% women. This result is also similar to the results of a study at Siti Hajar General Hospital Medan in 2011 which showed that 55% of patients were male. This research is also in accordance with the results of several other studies stating that pulmonary smear positive TB patients are more common in men than women.

According to some studies, men are indeed more susceptible to *M. tuberculosis* infection. This can be related to smoking habits that are greater in men, which causes interference with the respiratory tract immune system so that it becomes more susceptible to infection. Disorders of the respiratory tract immune system can be mucociliary damage due to toxic cigarette smoke and reduce the response to antigens, thereby increasing the susceptibility of pulmonary tuberculosis. In addition, men usually pay less attention to their health and daily habits that are more outside because work causes a trigger factor for pulmonary tuberculosis. This will have an impact on the low immune system and greater exposure factors.

Epidemiologically, there are evident differences between men and women in terms of infectious diseases, progression of disease, incidence and mortality due to TB. The development of the disease also has differences between men and women, namely women who have more severe disease when they come to the hospital. Women are often late in coming to health services compared to men. This may be related to disgrace and shame is felt more on women than men. Women also experience more concern about being ostracized from their families and the environment due to their illness [12]. Economic barriers and cultural socio-economic factors

play a role including an understanding of TB disease [8].

4.2. Age Risk Factors for the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

In this study, the results of statistical tests obtained OR of 0.175 and 95% CI (0.036–0.848) showed that age was a protective factor in the incidence of pulmonary TB in the Kotaraja Health Center Area of Jayapura City. Older age (≥ 33 years) more suffer from pulmonary TB than younger age groups (<33 years).

The results of this study are in line with the study of Oktavia and his colleagues [10] who found that the incidence of pulmonary TB was related to age (OR = 0.3; 95% CI 0.12-0.89) and was a protective factor in the incidence of pulmonary TB. Age in the case group is dominated by young groups (<42 years). Respondents with older age were less affected by pulmonary TB, by 0.33 times or 67% lower compared to young people. Younger people are more susceptible to TB disease because of their young age more activities and socializing with the work environment and families who have a history of TB

The results of Hiswani's study found that there was a significant relationship between age and incidence of pulmonary TB. This study shows that the higher the age the higher the incidence of pulmonary TB. Data from the Ministry of Health of the Republic of Indonesia, that around 75% of TB patients are in the productive age group. Pulmonary TB is most often found in productive age (15-50) years. Today, with the demographic transition, the life expectancy of the elderly is high. At an advanced age of more than 55 years a person's immunological system decreases, so it is very vulnerable to various diseases, including pulmonary TB [9].

Dotulung and his colleagues [13] also found that age was one of the risk factors for pulmonary TB incidence ($p = 0.012$). Most respondents were age groups ranging from 15-54 years as many as 65 respondents (67%) and fewer in the age group > 55 years as many as 32 respondents (33%). A dense working environment and dealing with many people can also increase the risk of pulmonary TB. Such working conditions make it easier for someone in their productive age to be easier and more suffering from pulmonary TB.

4.3. Risk Factors for education level on the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

The results of this study indicate that there was no effect on the level of education on the incidence of pulmonary TB in the work area of the Kotaraja Health Center in Jayapura City ($p = 1,000$).

The results of this study contradict Hiswani's [9] study which found that there was a significant relationship between the level of education and the incidence of pulmonary TB. This shows that the higher the level of education of a person the lower the incidence of pulmonary TB. The low level of education has the opportunity to suffer from pulmonary TB compared to higher education. The level of education will affect one's knowledge. The higher the level of education, then someone's knowledge will also be better. Because through the process of education, someone will learn various disciplines which, of course, with the learning process, someone will become aware of many things.

Education indirectly contributes to health status. Communities that have a higher level of education can get more income compared to those who have lower education who are very associated in improving nutritional status. With higher education the public can know more knowledge, especially about health, especially in preventive matters, so that people can improve their health status in a better direction. Education can influence someone to receive information. Someone who has higher education can easily absorb and receive information so that he is active in health care. Other studies show that lower education suffers more from TB than highly educated [9].

Oktavia and his colleagues [10] found that the level of education was a risk factor for the incidence of pulmonary TB ($p = 0.02$); OR = 3.94). The proportion of respondents with a low level of education in the case group was 39.4% while in the control group 24.2%. Respondents with low levels of education can increase their risk of developing pulmonary TB by 3.94 times compared to people who are highly educated.

The level of education generally relates to knowledge and awareness in healthy living behavior [14]. According to the results of a study conducted by Ubon [15] states that patients who experience recurrence of pulmonary TB 93% only have primary education.

4.4. Risk Factors for occupation on the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

The results of this study indicate that work is a protective factor in the incidence of pulmonary TB ($p = 0.012$; OR = 0.214; 95% CI (0.070–0.658)). Respondents who do not work (72.7%) have more pulmonary TB than respondents who work (27.3%). Respondents who worked had a chance of 0.214 times lower suffering from pulmonary TB compared to respondents who did not work.

Djuniati found that there was a significant relationship between work and the incidence of pulmonary TB. The results of this study explain that respondents who work contributed to someone infected with pulmonary TB, associated with exposure to *Mycobacterium tuberculosis* germs. The type of manual labor has the opportunity to be exposed to TB germs compared to other types of work such as civil servants, the military, and employees. Work is related to the level of income of a person who can influence socio-economic status. Where socio-economics can be an indirect cause of pulmonary TB cases such as inadequate fulfillment of family nutrition, healthy housing cannot be fulfilled and the ability to access health services is declining. This is in line with research that shows that there is a significant relationship between the type of work and the incidence of pulmonary TB, where groups of high-risk workers (drivers, laborers) are more at risk of suffering from pulmonary TB compared to groups of low-risk workers such as employees, civil servants / TNI / Polri and entrepreneur [16].

However Oktavia and his colleagues [10] found that work was not a risk factor for the incidence of pulmonary TB ($p = 0.62$; OR = 1.48; 95% CI 0.55-3.84). The proportion of respondents with employment in the case group was 30.3% compared to the control group of 30.3%.

4.5. Risk Factors for education level on the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

The results showed that knowledge had an effect on the incidence of pulmonary TB in the working area of Kotaraja Public Health Center in Kota Jayapura ($p = 0.057$). These results are in accordance with the study of Octavia [10] which shows that the OR value obtained is 1.448 (CI 95% 0.55-8), this indicates that respondents with low knowledge are at risk of 1.5 times the pulmonary TB affected compared to knowledgeable respondents high. In populations with a 95% confidence level, people with low knowledge increase the risk of pulmonary TB by 0.55 times to 3.8 times. In conclusion, with a p -value of $0.62 > 0.05$, it means that there is no statistically significant relationship between the level of knowledge and the incidence of pulmonary TB. The results of this study state that knowledge of pulmonary TB is not significantly associated with the incidence of pulmonary TB. From the results of the interview stated that the majority of respondents' knowledge did not know about how to prevent pulmonary TB with immunization (55.8%) as well as prevention with sunlight. The benefit of sunlight / lighting is that it can kill germs for only (51.5%). The number of respondents who answered correctly was not significantly different from those who answered incorrectly for questions about the causes, symptoms and how to avoid them. This can be caused by a lack of knowledge of respondents about this. Especially about prevention of pulmonary TB disease can indirectly allow the emergence of new cases of pulmonary TB, because if someone knows how to prevent an illness, they will be more vigilant and care about the dangers of pulmonary TB disease. Therefore, the TB prevention and prevention program (P2TB) should provide clear information to the surrounding community about pulmonary TB, as well as a healthy housing environment. This can be realized by making a leaflet / poster about TB so that respondents will know about the disease so that they will know how to prevent it so that transmission and new cases of pulmonary TB can be suppressed.

4.6. Risk Factors for the history of TB in the family on the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

The results showed that the history of TB in the family affected the incidence of pulmonary TB in the work area of the Kotaraja Public Health Center in Kota Jayapura ($p < 0.001$; OR = 13,571). This result is in line with the research of Octavia [10] who found that the history of contact with TB patients was associated with the incidence of TB with a statistical test obtained value OR 4,667 (95% CI 1.44-15-15). People who had contact with pulmonary TB patients were at a risk of 4.7 times greater exposure to pulmonary TB compared to respondents who had never contacted pulmonary TB patients. In populations with a 95% confidence level, people who had contact with pulmonary TB patients were at risk of 1.44 times to 15.07 times greater exposure to pulmonary TB compared to respondents who had never contacted pulmonary TB patients. In conclusion, p -value $0.02 < 0.05$, meaning that there is a statistically significant relationship between contact with pulmonary TB patients with the incidence of pulmonary TB. The results of this study indicate that there is a significant relationship between contact with pulmonary tuberculosis patients at risk of 4.7 times greater exposure to pulmonary TB than those who did not contact pulmonary TB patients. This is caused by the presence of positive AFB hosts transmitting pulmonary TB infection to healthy people through droplets that contain thousands of *Mycobacterium tuberculosis*, and if a person's condition is weak, it is very susceptible to pulmonary TB disease.

The main factor affecting the occurrence of infection is the source of infection. In this case, there are people affected by tuberculosis (Host). The presence of a positive AFB host transmits pulmonary TB infection to healthy people through droplets (saliva splashes) that contain thousands of *Mycobacterium tuberculosis* bacteria [17]. The source of transmission is patients with positive AFB pulmonary TB. When coughing or sneezing, patients spread germs into the air in the form of droplets (sputum sparks). Droplets containing germs can survive in the air at room temperature for several hours. People can get infected if the droplet is inhaled into the respiratory tract, the pulmonary TB germs can spread from the lungs to other parts of the body, through the circulatory system, lymphatic system, airway, or direct spread to other body parts.

Transmission power from a patient is determined by the number of germs, which are removed from the lungs. The higher the positive degree of negative sputum results (no germs are seen), the patient is considered not contagious. The possibility of someone being infected with pulmonary TB is determined by the concentration of droplets in the air and the length of time they breathe. Excessive contact with *Mycobacterium tuberculosis* is contact that lasts for 3 months or more. Especially seen from the habits of patients who are less well in the management of secretions (saliva), occupancy density, and the condition of public housing which generally lacks health requirements [18].

4.7. Risk Factors for the history of drinking alcohol on the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

The results showed that drinking alcohol was a risk factor for the incidence of pulmonary TB ($p = 0.001$; OR = 7.268; 95% CI (2,328–22,805)). Respondents who had a history of drinking alcohol were more (68.2%) suffering from pulmonary TB compared to respondents there is no history of drinking alcohol. Respondents who drank alcohol had a tendency to be affected by pulmonary TB 7.268 times higher than respondents who did not drink alcohol.

Although alcohol consumption is considered socially acceptable throughout the world, it can cause dependence. The problem of alcohol consumption varies greatly. Alcohol use can be a contributing factor in more than 200 injuries and conditions, including tuberculosis, worldwide [19]. It is estimated that around 10% of all tuberculosis cases are caused by alcohol use. The relationship between alcohol use and tuberculosis has long been known, although there are inconclusive findings related to various confounding factors, because it is still unknown whether the increased risk of tuberculosis is caused by alcohol use, such as liver damage and nutritional deficiencies, or social factors. However, *in vivo* and *in vitro* studies have shown that alcohol use significantly disrupts the immune response, increasing susceptibility to respiratory diseases such as tuberculosis [20]. Various population-based studies show that there is a strong relationship between alcohol use and tuberculosis [21]. In a meta-analysis that included 3 cohort studies and 18 case-control studies, Lonnroth [22] showed that heavy alcohol use (defined as ≥ 40 g alcohol per day) was found to be at risk for the development of 3.50 active tuberculosis (95% CI: 2.01-5.93). There were no exceptions from smaller studies (due to suspected publication bias) or adjustments for various sets of confounders to change the results significantly. In a prospective study conducted in China, a group of adults was followed for an average of 16.8 ± 5.2 years [23]. The authors found that alcohol consumption (≥ 2 drinks per day) was associated with an increased risk of

tuberculosis when accompanied by smoking (hazard ratio = 1.51; 95% CI: 1.11-2.05), which is another risk factor for development active tuberculosis [24]. Alcohol abuse affects not only the incidence of tuberculosis but also its evolution and clinical outcomes. Individuals with alcoholic habits are considered more contagious because they have been associated with findings of cavity disease on chest x-rays and are therefore positive smear. [25].

4.8. Risk Factors for the history of DM on the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

The results of this study found that the history of DM was not a significant risk factor for the incidence of pulmonary tuberculosis in the Kotaraja Public Health Center in Jayapura ($p = 0.869$; OR = 0.476; 95% CI (0.050–4.536). the incidence of pulmonary tuberculosis because the proportion of DM history is very small (7.6%).

The results of this study contradict the previous study, Sianturi [26] which stated that there was a significant relationship between the history of taking medication and recurrence of pulmonary tuberculosis with p value = 0.001 (<0.05) and OR = 9,450.

Patients with diabetes mellitus (DM) have a higher risk of experiencing a transition from latent to active tuberculosis. The diagnosis of DM also increases the risk of developing an initial infection in active tuberculosis. Case control studies show that the chance of developing tuberculosis is 2.44 to 8.33 times higher in patients with DM than in those who do not [27]. A systematic review of 13 observational studies found that the diagnosis of DM tripled the risk of developing tuberculosis (relative risk = 3.11; 95% CI: 2.27-4.26). Several studies have shown that patients with DM are more likely to develop multidrug-resistant tuberculosis (MDR-TB), although there is no explanation for that association [28]. Meanwhile, other studies show no increased risk of MDR-TB in patients with DM [29]. Approximately 15% of cases of tuberculosis worldwide may be associated with DM. The prevalence of DM reported among tuberculosis patients ranges from 1.9% to 45.0% worldwide. The prevalence of tuberculosis reported among DM patients ranges from 0.38% to 14.0%, and the overall prevalence is reported to be 4.1%, with the interquartile range (IQR) 1.8% -6.2%. WHO recommends two-way screening, screening for DM in all patients with tuberculosis and vice versa.

4.9. Risk Factors for the history of smoking on the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura

The results of this study found that smoking was a risk factor for the incidence of pulmonary TB ($p = 0.008$; OR = 4.911; 95% CI (1,628-14,817). The proportion of respondents who smoked more (59.1%) who suffered pulmonary TB compared to respondents who no smoking (40.9%) Respondents who smoke have a tendency to be exposed to pulmonary TB 4,911 times higher than non-smoking respondents.

This research is in line with Nurhanah's [30] study which states that there is a significant relationship between smoking habits and the incidence of pulmonary TB. This shows that smoking is a negative behavior towards public health. Cigarettes contain many substances that are harmful to the body such as nicotine, carbon

monoxide, tar, benzene and methanol. Smoking habits can reduce the body's resistance so that TB germs can easily enter a person's body. Smoking is one of the common habits encountered in everyday life. This life style is interesting as a health problem, at least it is considered a risk factor for various diseases. Smoking is a problem among the younger generation and society in terms of health.

This study is also in line with some of the results of previous studies stating that there is a significant relationship between smoking and the incidence of pulmonary TB. And other studies suggest that there is a significant relationship between cigarette smoking and the incidence of pulmonary TB.

5. Conclusion

Based on the results of data analysis and hypothesis testing, it can be concluded as follows:

1. There is no gender influence on the incidence of pulmonary tuberculosis in the Jayapura City Kotaraja Health Center Working Area { $p = 0.136$; OR = 0.396; 95% CI (0.139–1129)}.
2. There is an influence of age on the incidence of pulmonary tuberculosis in the Kotaraja Health Center Jayapura City Work Area { $p = 0.040$; OR = 0.175; 95% CI (0.036–0848)}.
3. There is no influence on the level of education on the incidence of pulmonary tuberculosis in the Kotaraja Health Center Jayapura City Work Area { $p = 1,000$; OR = 0.908; 95% CI (0.315–2,619)}.
4. There is work influence on the incidence of pulmonary tuberculosis in the Jayapura City Kotaraja Health Center Working Area { $p = 0.012$; OR = 0.214; 95% CI (0.070–0.658)}.
5. There is no influence of knowledge on the incidence of pulmonary tuberculosis in the Jayapura City Kotaraja Health Center Working Area { $p = 0.057$; OR = 0.267; 95% CI (0.078-0,917)}.
6. There is an influence on the history of pulmonary tuberculosis in the family against the incidence of pulmonary tuberculosis in the Kotaraja Public Health Center in Jayapura City { $p = 0.000$; OR = 13,571; 95% CI (3,438-53,568)}.
7. There is no effect of history of DM on the incidence of pulmonary tuberculosis in the Jayapura City Kotaraja Health Center Working Area { $p = 0.869$; OR = 0.476; 95% CI (0.050–4,536)}.
8. There is an influence of smoking on the incidence of pulmonary tuberculosis in the Jayapura City Kotaraja Health Center Working Area { $p = 0.008$; OR = 4.911; 95% CI (1,628–14,817)}.
9. There is an effect of drinking alcohol on the incidence of pulmonary tuberculosis in the Jayapura City Kotaraja Health Center Working Area { $p = 0.001$; OR = 7,268; 95% CI (2,328–22,805)}.
10. The dominant factor that influences the incidence of pulmonary TB in the Kotaraja Public Health Center in Jayapura is a history of TB in the family, smoking history, drinking history, occupation and age.

6. Suggestion

1. The Provincial Health Office and Public Health Center need to improve preventive and promotive efforts in the context of TB prevention through activities, outreach/counseling on the "TOSS TB" program, life movements with PHBS (Clean and Healthy Life Behavior) and eliminate stigma and

discrimination against TB patients.

2. Active case findings need to be increased by conducting household contact investigations and screening in at-risk populations, especially in the area with a high number of cases and rapid population growth rates.
3. For further researchers to be able to examine other factors or variables not examined yet, for example, the extent of ventilation, lighting, humidity, etc. which can also affect the incidence of pulmonary tuberculosis.

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