THE ANALYSIS OF MULTIPLE LINEAR REGRESSION IN DETERMINING THE EFFECT OF LOW BIRTH WEIGHT INFANTS (LBW) AND NON-EXCLUSIVE BREASTFEEDING TOWARD PNEUMONIA OCCURRENCE IN EAST JAVA PROVINCE IN 2016

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ABSTRACT

Introduction: Pneumonia is one of the acute respiratory infections affecting children under the age of five which is the main causes of morbidity and mortality in developing countries. It is viewed from the epidemiological triangle that there are many factors causing pneumonia. Some of the factors are Low Birth Weight infants (LBW) and non-exclusive breastfeeding. Both of these factors can cause the immune system to be weak, so it facilitates the spread of bacteria including the pneumonia ones.

Research Objective: The objective of the research is to determine the effect of LBW and non-exclusive breastfeeding towards the incidence of pneumonia in East Java Province in 2016.

Research Method: This research is an analytic observational research using retrospective research with sample of 37 regencies / cities in East Java Province using Simple Random Sampling and then analyzed using Multiple Linear Regression.

Result/Findings: Based on the results using Multiple Linear Regression analysis, the obtained significant value of each variable is LBW (0.010) and non-exclusive breastfeeding (0.014) and also the value of coefficient of determination is 0.295 or 29.5%.

Conclusion: There is a significant influence of the LBW and exclusive breastfeeding variables toward the occurrence of pneumonia and 29.5% of pneumonia event diversity can be explained by the LBW and non-exclusive breastfeeding variables.

Key Words: Multiple Linear Regression analysis, pneumonia, LBW, non-exclusive breastfeeding
1.0 INTRODUCTION

Pneumonia is a lung infection affecting children under five years old which is frequently caused by bacteria and virus through direct contact with an infected person. Mortality due to pneumonia in children under five years of age throughout the world amounted to 16% by the year 2015, but the most common occurrence is in South Asia and Sahara Africa [9].

In Indonesia from 2014 to 2016, the incidence of pneumonia continues to rise. Significant increase occurred from 2014 in the amount of 29.47% to 63.45% in 2015. Then in 2016 there was an increase again to 65.27% [1].

East Java is one of the provinces with the highest cases of pneumonia that is 90,256 cases and is the province that accounts for the number of deaths due to pneumonia in Indonesia amounted to 142 deaths [1]. East Java Province in 2015 from 38 districts / cities, there are still 2 districts / cities that reach less than 10%. They are Sampang and Probolinggo. In 2015 there is an increase in coverage of pneumonia above 50% even though it has not reached the national target that has been determined [2].

Pneumonia can be caused by many factors, two of which are LBW and non-exclusive breastfeeding (not exclusively breastfed). Babies born with low weight would be more susceptible to respiratory infections than babies who are born with normal weight. The imperfect formation of anti-immune substances causes the baby to be more susceptible to respiratory infections including pneumonia [2].

Babies born with LBW, then not getting exclusive breastfeeding can cause the body's immune to be lower and vulnerable to health problems. Exclusive breastfeeding given until the age of 6 months serves as a protector of various viruses and bacteria including bacteria pneumonia. Therefore toddlers who do not get Exclusive breast milk risk 4.47 times suffer from pneumonia compared to toddlers who get exclusive breastfeeding. Exclusive breastfeeding is proven to increase the immunity of infants becoming stronger, so it avoids them from health problems [4].

The objective of the study is to determine the influence of LBW and non-exclusive breastfeeding to the incidence of pneumonia in East Java Province in 2016 by using multiple linear regression analysis.

2.0 RESEARCH METHOD

This study was an analytic observational study using retrospective research design using secondary data such as the rates of the incidence of pneumonia in young children, the occurrence of exclusive breastfeeding, the case of malnutrition, and the incidence of healthy house obtained from the profile of Health Office of East Java in 2016. The research was conducted in East Java Province.

The population in this study was all districts and cities in the province of East Java that is 38 districts / cities. The sample is obtained by simple random sampling technique by using the formula of large sample calculation from Stanley Lemeshow, so the sample size in this
research was 37 regencies / cities. The analysis uses Multiple Linear Regression with SPSS (Statistical Product and Service Solutions) 21 program.

3.0 RESULT

a. The Description of the Pneumonia Occurrence Rate in Toddlers in East Java Province

The Trend of The Number of Cases of Pneumonia In East Java province from 2011 to 2016

Figure 1 shows that cases of pneumonia in East Java Province from year to year fluctuate. The highest cases of pneumonia occur in 2014 which are 110,976 incidents.

Figure 2: Trend Number of Cases of Pneumonia in East Java Province 2016
(Source: Profile of East Java Provincial Health Office 2016)

Figure 2 depicts the incidence of pneumonia in 38 districts / cities in the province of East Java in 2016. There are 3 districts with the highest number of pneumonia events. They are Sidoarjo regency with 8411 cases, Jember regency with 8065 cases, and Gresik Regency with 7344 cases.
In 2016, East Java province is the second province of the highest incidence of pneumonia after West Java with 90,256 cases and is the province with the highest number of infant deaths due to pneumonia with 142 deaths. (Data and Information Indonesia Health Profile, 2016).

**b. The influence of Low Birth Weight (LBW) and Non-Exclusive Breastfeeding toward the incidence of Pneumonia in East Java province**

**Table 1:** Anova analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>58862624.554</td>
<td>2</td>
<td>29431312.277</td>
<td>8.532</td>
<td>.001</td>
</tr>
<tr>
<td>Residual</td>
<td>117281080.148</td>
<td>34</td>
<td>3449443.534</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>176143704.703</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Pneumonia
b. Predictors: (Constant), Non ASI, BBLR

Based on the output shown above, in table 1 it indicates that the results of the anova analysis of variable Low Birth Weight (LBW) and non-exclusive breastfeeding has the value significance of 0.001, where this value is smaller than the \( \alpha \) (0.005), so it can be concluded both the variables examined have influence jointly against the occurrence of pneumonia.

**Table 2:** Multiple Linear Regression analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>211.112</td>
<td>677.645</td>
<td>.312</td>
<td>.757</td>
</tr>
<tr>
<td>LBW</td>
<td>2.577</td>
<td>.949</td>
<td>.386</td>
<td>2.715</td>
</tr>
<tr>
<td>Non Breastfeeding</td>
<td>.308</td>
<td>.119</td>
<td>.367</td>
<td>2.578</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Pneumonia

Table 2 shows that all the independent variables that were examined, namely LOW BIRTH WEIGHT (LBW) and non-exclusive Breastfeeding had significant effects against the incidence of pneumonia in East Java province. The variable of LBW has 0.010 significance value, and the variable of non-exclusive Breastfeeding has 0.014 significance value, which these values is smaller than the trust level which is 0.05. Furthermore both variables have a value of coefficient of determination (Adjusted \( R^2 \)) produced by 0.295. It can be interpreted that 0.295 or 29.5% of the diversity of pneumonia events can be explained by the LBW and non-exclusive breastfeeding factors, while the rest can be explained by other factors that are not researched.
4.0 DISCUSSION

Pneumonia is one of the world's health problems and the biggest contributor to the cause of death of children under the age of five years \(^9\). Based on the Indonesia Health Profile (2015) pneumonia is the cause of 15% of infant mortality, which is 922,000 children under five in 2015. Risk factors for the incidence of pneumonia are divided into two groups: intrinsic factor and extrinsic factor. Intrinsic factors include age, nutritional status, exclusive breastfeeding, and LBW.

Some issues such as nutritional imbalances of the body's need related to the inability of absorption, ineffective breathing patterns associated with immaturity of the respiratory organs, the risk of body temperature imbalance and the risk of infection associated with poor immune systems are some of the problems that infants often encounter with LBW. Children with Low Birth Weight (BBLR) are more at risk of health problems including pneumonia, because toddlers tend to have a weak immune system and the function of the organ that has not been perfect yet. Weak immune and the growth of organ function that has not been perfect will make the baby susceptible to disease if ignored.

This is in accordance with the research conducted by the Ceria (2016), that babies with Low Birth Weight (LBW) are at risk of suffering from pneumonia of 8.90 times compared to infants with normal birth weight. This research is also in line with research Triana (2017), which shows that there is influence of LBW status on the incidence of pneumonia in toddlers at the Puskesmas (Public Health Centre) Medan Krio. Based on Odds Ratio (OR) generated Triana’s research (2017), it is stated that infants with low birth weight (LBW) have a chance 5 times more likely to suffer from pneumonia.

A weak immune system is not only caused by toddlers with low birth weight (BBLR) but also because the toddler does not get exclusive Breastfeeding (Breast milk). Exclusive breastfeeding is breast milk given to infants up to 6 months of age without any additional food. Exclusive breastfeeding is very good for the development and growth of infants because breast milk contains antibodies that are useful to prevent and neutralize bacteria, viruses, fungi and parasites \(^2\).

In this study, non-exclusively breastfed infants have a significant effect on the incidence of pneumonia. The results of this study is also in accordance with the research conducted by Annah (2012), stating that not providing exclusive breastfeeding to toddlers is a risk factor for the incidence of pneumonia in infants with Odds Ratio = 2.49. It means that children who are not exclusively breastfed have a 2.49 times greater risk suffering from pneumonia compared with children who are exclusively breastfed. Inadequate breast milk for having to work and babies who do not want to drink milk are some reasons mothers do not breastfeed exclusively to toddlers or infants.
This research is also in line with a research carried out by Ceria (2017) indicating that toddlers who are not breastfed exclusively have the risk of suffering from pneumonia of 3.31 times compared with infants who are exclusively breastfed. It means that toddlers given exclusive breastfeeding have a smaller chance than toddlers who are not given exclusive breastfeeding to suffer from pneumonia. Toddlers who are not exclusively breastfed are more likely to suffer from health problems including pneumonia because they do not get the benefit of breast milk fully where breast milk plays a role in the formation of antibodies and as a defense against diseases.

Based on table 3.3, the researcher gets multiple linear regression equation as follows:

\[ Y = 211,112 + 2,577 \text{ LBW} + 0.308 \text{ Non-Exclusive Breastfeeding} \]

The equation stated above can indicate that the value of 2.577 on the LBW variable and the value of 0.308 on Non-exclusive Breastfeeding variable is positive so it can be concluded that the higher cases of LBW, the higher the incidence of pneumonia.

**5.0 CONCLUSION**

The highest cases of pneumonia in East Java province occurred in 2014 with 110,976 incidents. In 2016 it decreased to 90,256 cases. Even though it declined, East Java Province is one of the provinces with the highest rates of pneumonia occurrence. The three districts having the highest incidence of pneumonia in East Java Province are Jember, Sidoarjo and Gresik Regencies.

In this research, it was found that LBW and Non-exclusive breastfeeding had significant influence on the incidence of pneumonia in toddlers in East Java Province with each significant value that is BBLR equal to 0.010 and non-exclusive breast feeding equal to 0.014 and have value of determination coefficient (Adjusted R2) which equal to 0.295. It can be interpreted that 0.295 or 29.5% of the diversity of pneumonia events can be explained by the LBW and non-exclusive breastfeeding factors, while the rest can be explained by other factors that are not researched.
6.0 RECOMMENDATION

1. Areas prone to the occurrence of pneumonia cases are expected to be a concern for the government as well as people in the region.
2. It is expected that the puskesmas can improve and maintain the posyandu program that is the improvement of people's nutrition in integrated baby service post.
3. Factors that can affect the high cases of pneumonia should be more attention and improved, so that cases can be reduced. And prevention of pneumonia can start from the family scope.

ACKNOWLEDGEMENT

I am highly thankful to all the people who have helped this research and publication process.

DECLARATION

Author(s) declare that all works are original and this manuscript has not been published in any other journals. There was no financial support of any organization for this work.

REFERENCES


