

Tropical Medicine Journal

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- The Effects of Curcumin Against Dengue-2 Virus Based on Immunocytochemistry Technique
- Risk Factors Analysis of Typhoid Fever Occurrence of Inpatient in Kebumen Public Hospital in 2013
- Knowledge, Attitude and Practice on Dengue Fever Transmission Among Urban and Periurban Residents of Dhaka City, Bangladesh
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Risk Factors of Pneumonia Among Under Five Children in Purbalingga District, Central Java Province

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ABSTRACT

Introduction: Pneumonia is the leading cause of mortality and morbidity in young children and burden of disease disproportionately high in South-East Asia Region. Pneumonia incidence in Indonesia is sixth rank in the world. Pneumonia were leading cause of infants mortality about 23.8% and among children, pneumonia contribute 15.5% of total mortality after diarrhea. Risk factors associated with pneumonia are: individual, environment, and social economic.

Objectives: The aim of study to identify relationship between individual, environment, and social economic risk factors with pneumonia incidence among under five children in Purbalingga District.

Methods: This research was an analytical and observational study using case control design. Subjects were 210 children aged 2-60 month which consists of 105 cases and 105 controls. This study conduct at 9 Public Health centers in Purbalingga District on April to June 2013. Cases were children with pneumonia diagnose by trained doctor or paramedic. Controls were children without diagnosed pneumonia who visited the same Public Health Centers as cases. Results from univariate, McNemar test was used to bivariate analysis and conditional logistic regression in multivariate analysis with 95% confidence interval.

Results: In the multivariate analysis showed not exclusively breastfed (OR=3.99, 95% CI=1.851-8.596), house humidity (OR=3.13, 95% CI=1.382-7.096), house ventilation (OR=6.62, 95% CI=2.847-15.369), overcrowding (OR=2.74, 95% CI=1.230-6.121) and without kitchen smoke hole (OR=6.14, 95% CI=1.932-19.497) had significant association to pneumonia incidence. Ventilation showed the highest risk for pneumonia incidence among under five children.

Conclusion: Factors such as not exclusively breastfed, live in house with high humidity, lack of ventilation, overcrowding and without kitchen smoke hole were risk factors for pneumonia among under five children. Ventilation was dominant risk factor for developing pneumonia. Promote breastfeeding and improve house condition such as improve house ventilation and make kitchen smoke hole could lead to reduction of pneumonia under five children.

Keyword: under five children, pneumonia, risk factors, Purbalingga District

INTISARI

Metode: Penelitian ini adalah analitik observasional dengan desain kasus kontrol. Subyek penelitian sebesar 210 orang, terdiri dari 105 kasus dan 105 kontrol. Lokasi dan waktu penelitian di 9 wilayah Puskesmas di Kabupaten Purbalingga. Penelitian dilaksanakan Bulan April-Juni 2013. Subyek penelitian anak balita umur 2 bulan – 5 tahun yang didiagnosis pneumonia oleh dokter atau tenaga paramedic terlatih program standar P2 ISPA (MTBS). Kontrol penelitian anak balita umur 2 bulan – 5 tahun yang tidak didiagnosis pneumonia. Analisis menggunakan univariabel, bivariabel dengan uji *Mc Nemar* dan analisis multivariable dengan *conditional* regresi logistic dengan 95% *confidence interval*.

Hasil: Setelah dilakukan analisis multivariable dengan *conditional logistic regression*, hanya 5 variabel yang berhubungan dengan kejadian pneumonia balita yaitu tidak mendapatkan ASI eksklusif (OR=3,99, 95% CI=1,85-8,59), ventilasi rumah (OR=6,62, 95% CI=2,85-15,37), kepadatan hunian rumah (OR=2,74, 95% CI=1,23-6,12), kelembaban rumah (OR=3,13, 95% CI=1,38-7,10), dan keberadaan lubang asap dapur (OR=6,14, 95% CI=1,93-19,50). Ventilasi merupakan faktor risiko dominan terhadap kejadian pneumonia pada anak balita di Kabupaten Purbalingga.

Simpulan: Beberapa faktor seperti tidak mendapatkan ASI eksklusif, kurangnya ventilasi rumah, kepadatan hunian, kelembaban rumah, dan keberadaan lubang asap dapur merupakan faktor risiko kejadian pneumonia. Ventilasi rumah merupakan faktor risiko dominan terhadap kejadian pneumonia. Kegiatan promosi ASI eksklusif dan perbaikan kondisi lingkungan rumah seperti kepadatan hunian, ventilasi rumah, dan lubang asap dapur dapat menurunkan risiko kejadian pneumonia balita.

Kata Kunci: balita, pneumonia, Kabupaten Purbalingga, faktor risiko

INTRODUCTION

According to the recent studies, pneumonia remains the leading killer of young children around the world. Every year, pneumonia claims the lives of more than 1 million children before their fifth birthday accounting for more young death annually than AIDS, malaria and tuberculosis combined. This loss of life is especially tragic because pneumonia is preventable and treatable¹. Pneumonia known as the forgotten disease in the developing countries, because so many victims but so little attention is paid to this disease². About 156 million of new pneumonia episodes each year worldwide, of which 95% episodes are in the developing world, more than half occur in the South-East Asia and Sub-Sahara Africa region. More than half of the world's annual new pneumonia

cases are concentrated in 15 countries, Indonesia is counted as country with sixth high numbers of new pneumonia cases (6 million)³.

Based on national basic health survey on 2007, pneumonia is leading cause of infant deaths (23.8%) and number two of childhood deaths (15.5%) after diarrhea of total children mortality. This shows that pneumonia is public health problem that contribute to high mortality in children under five in Indonesia⁴. Based on data from pediatrics installation Purbalingga District Central Hospital on 2011, it show that reason children visited hospital due to pneumonia account 9,03% take third place on the top ten of the most disease visited in the installation⁵.

High burden of mortality and morbidity of children under five due to pneumonia in developing countries are related to a large

number of pneumonia risk factors, including; social economic (family income and low parenteral illiteracy), nutritional (malnutrition, vitamin A supplementation, low birth weight, prematurity, lack of exclusive breastfeeding, zinc supplementation), environment (crowding, house ventilation, type of floor, kitchen location, indoor air pollution, humidity, and family members who smoking), incomplete immunization, concomitant illnesses (anemia, diarrhea, measles, thalassemia, and sickle cell disease)⁶. The present study is aimed to identify the relationship between individual, environment, and social economic risk factors with pneumonia incidence among under five children in Purbalingga District.

MATERIAL AND METHODS

The study used an observational analytic study with case-control design. This study conducted at 9 Public health centers in Purbalingga District. The study area was chosen due to availability of doctors or paramedic trained on WHO ARI guidelines and has a special room for integrated case management illness (IMCI). The population of this study used all children aged 2 month to 5 years who residents of Purbalingga District. This study period was April to June 2013. Cases were children aged 2 month to 5 years diagnosed pneumonia or severe pneumonia by doctors or paramedic according to WHO ARI guidelines, registered as an outpatient or inpatient in public health centers and live in Purbalingga District. Controls were children 2 month to 5 years of aged without pneumonia disease who came to same public health centers as cases. We used matched by aged and sex between cases and controls. If there more than one children in the same sex an age, just one children chosen to be control

who live in the same community as cases. Children with chronic illness such as known cardiac disease, renal failure, HIV/AIDS, bronchitis, tuberculosis, were not included in the study. Two hundred and ten children who fulfilled the entry criteria for study were enrolled (105 cases and 105 controls). The sampling technique used in the study was consecutive sampling⁷. Dependent variable was pneumonia, independent variable were; individual risk factors (low birth weight, nutritional status, immunization status, diarrhea episodes, vitamin A supplementation and exclusive breastfeeding), environment risk factors (overcrowding, any household members smoking, house ventilation, type of floor, type of wall, kitchen location, kitchen smoke hole, cooking fuels, and humidity) and social economic risk factors (parents illiteracy and family income). Controlled variables were aged and sex.

Data were analysed by univariate, bivariate analysis with the McNemar test to measure odds ratios, with 95% confidence intervals (CI) and *p*-value less than 0.05 indicated a statistically significant level. For those factors that reached significance in bivariate analysis, a conditional logistic regression test was used in multivariate analysis to evaluate the combined effect of multiple risk factors, adjusting for confounding variables. This study was approved by the Medical Ethics Committee of Faculty of Medicine and Health Yogyakarta and by the Office of National and Political Unity Purbalingga Government.

RESULTS AND DISCUSSIONS

In this study, 105 cases were compared to 105 controls. Male was found slightly high (59.1%) compared to female. Majority of children were 1 to 4 years old (70.9%). The bivariate analysis showed from 17 variables, there was

12 variabels were significantly associated with pneumonia under five children; nutritional status ($p=0,035$; OR=4; 95% CI=1,08-22,09), diarrhoea episodes illness ($p=0.014$; OR=2.45; 95% CI=1.18-5.48), low birth weight ($p=0.004$; OR=4.5; 95% CI=1.48-18.28), not exclusively breastfed ($p=0.000$; OR=4.5; 95% CI=2.24-10.01), overcrowding ($p=0.000$; OR=3.40; 95% CI=1.64-7.72), house ventilation ($p=0.000$; OR=4.88; 95% CI=2.25-12.08), type of floor ($p=0.000$; OR=5; 95% CI=1.88-16.72), kitchen smoke hole ($p=0.000$; OR=9.76; 95% CI=2.99-49.59), humidity ($p=0.000$; OR=3.89; 95% CI=1.83-9.12), and family income ($p=0.000$; OR=4.83; 95% CI=1.97-14.24).

Tabel 1. Results of multivariable analysis between risk factors with under five children pneumonia in Purbalingga District

Independent Variables	OR	95% CI	P Value
Exclusively breastfed	3.99	1.851-8.596	0.000*
Overcrowding	2.74	1.230-6.121	0.014*
House ventilation	6.62	2.847-15.369	0.000*
Humidity	3.13	1.382-7.096	0.006*
Kitchen smoke hole	6.14	1.932-19.497	0.002*
<i>Pseudo R2</i>		36,40%	

Information: *Statistically significant ($p < 0,05$)

The multivariate analysis accounting the influence of the other variables, 16 variables were chosen as those with a p value of less than 0.25 in the bivariate analysis. Result showed that 5 variables were significantly associated with pneumonia under five children which are not exclusively breastfed ($p=0.000$; OR=3.99; 95% CI=1.85-8.60), overcrowding ($p=0.014$; OR=2.74; 95% CI=1.23-6.12), house ventilation ($p=0.000$; OR=6.62; 95% CI=2.85-15.37), humidity ($p=0.006$; OR=3.13; 95% CI=1.38-7.10), and kitchen smoke hole ($p=0.002$; OR=6.14; 95% CI=1.93-19.50).

ventilation was the strongest risk factors for developing pneumonia under five children.

This study found that majority of subjects aged 1 - < 4 years (70.9%). Generally, all children under the age of 5 years were at increased risk, however, those of an age where they were likely to be weaned (6 – 23 months) appeared to be at the greatest risk. Very young infants (0 – 5 months) may have been breastfed, and therefore protected by maternal immunity, and children older than 3 years were less at risk of disease, probably because of acquired immunity⁸. Most of subject were boys (59.1%), many other studies have also shown that boys were more frequently affected by acute respiratory infections than girls. Exact cause of male predominance was not known, however the possibility of gender bias in seeking medical care⁹.

There was no association between low birth weight and pneumonia under five children. Differences with other studies were probably due to small proportion of low birth weight (10.5%) in this study and there were no differences between cases (17.1%) and controls (3.8%). Selection of subjects only from health centers while other studies using subjects from the hospital so it showed the significance of low birth weight with pneumonia. Further research is needed to establish the relevance is the disruption of the integrated development of airways and alveoli to low-birth-weight infants in developing countries¹⁰.

There was no association between nutritional status and pneumonia under five children. Differences with other studies were probably due to small proportion wasting (low weight-for-height) in this study (7.1%) and all subjects were

diagnosed pneumonia, while other study showed significant association between under nutrition and severe pneumonia⁹. There was no association between episodes of diarrhea and pneumonia under five children. Differences with other studies was likely due to the small proportion of subjects who experienced diarrhea (25.7%) and number of diarrhea episodes > 2 times in the previous 6 months (5.7%) with average duration of diarrhoea episodes were 3 days. It has been shown that children who suffer from repeated or severe episodes of diarrhoea were also at a higher risk of acute lower respiratory infection¹¹.

Immunization status was not significantly associated with pneumonia under five children. This could be attributed to high proportion of complete immunization status among cases (88.6%) and controls (93.3%). This study used information about immunization status from routine immunization program. Vaccines are a safe and effective tool for preventing pneumonia before it occurs. Organization of WHO recommends that routine childhood immunization programs in all countries include four vaccines that prevent pneumonia¹. In Indonesia, pneumococcal immunization is ineffective because it does not fit serotype and immunization against other pathogens (RSV, staphylococci, and Gram negative) are not available¹².

Vitamin A supplementation was not significantly associated with pneumonia under five children. This could be attributed to high proportion of subject with complete vitamin A supplementation (73.8%), there were no differences between cases (70.5%) and controls (77.1%). There were no significant differences

in the clinical features of pneumonia between the groups of children who received vitamin A supplementation and who did not¹³. Exclusive breastfeeding was significantly associated with pneumonia. Breast milk has unique anti-infective properties, providing passive protection against pathogens (antibacterial and antiviral substances including secretory IgA)¹⁴.

Overcrowding was significantly associated with pneumonia. Exposure to infectious agents in the family may be most intense when sharing a bedroom with others¹⁵. Family members who smoke were not significantly associated with pneumonia. The proportion of family members who smoke in this study was high (90.9%) and there was no differences between cases (94.3%) and controls (87.6%). The effect of environment smoke exposure (ETS) on childhood pneumonia has not been fully elucidated. Several studies have investigated the effect of ETS exposure as a risk factor for childhood pneumonia, mainly in developing countries were inconsistent¹⁶. House ventilation was significantly associated to pneumonia. Lack of ventilation might induce dampness and smell, which are risk factors of pneumonia¹⁷. Ventilation is the process of supplying outdoor air to enclosed rooms it can control the indoor air quality by both diluting the indoor air with less contaminated outdoor air and removing the indoor contaminants with the exhaust air¹⁸.

There was no association between type of floors with pneumonia. Differences with other studies were probably due to high proportion of subject with cements or ceramic floors (82.9%), there was no differences between cases (73.3%) and controls (92.4%). No differences was observed between type of house and prevalence of acute

respiratory infections in Gujarat¹⁹. There was no association between type of walls with pneumonia. Differences likely due to high proportion of subject with type of walls made by permanent materials (60%), there was no differences between cases (45.7%) and controls (34.3%) with type of walls made by non permanent materials. No differences was observe between type of house and prevalence of acute respiratory infections in Gujarat¹⁹. There was no association between kitchen location with pneumonia. Differences was likely due to most subjects had kitchen location with insulation (70.9%), and there was no differences between cases (36.2%) and controls (21.9%) with kitchen without insulation. Environmental or geographic pneumonia risk factors include biomass combustion exposure like wood-smoke, day care attendance, refugee environment, positive upper respiratory infections symptoms in household contacts, and rainy or winter season²⁰.

Kitchen smoke hole was significantly associated with pneumonia. Kitchen smoke removal equipment was also found to be strongly and positively associated with pneumonia. However, smoke removal can decrease aerosols and airborne pollutants in the kitchen¹⁷. There was no association between cooking fuels with pneumonia. There was no differences in the proportion of subject use wood (49.5%) and gas or electricity (50.5%) as their primary cooking fuel. The negative health effects of these pollutants from biomass cooking fuels were particularly severe for young children who tend to stay indoors and were often carried on their mothers backs or laps while their mothers were cooking²¹. Most of subjects were big family,

while mothers cook, children carried by other family members so they did not stay in the kitchen with their mothers.

Humidity was significantly associated with pneumonia. Temperature and humidity is very closely related to the growth and proliferation of etiological factors of pneumonia in the form of viruses, bacteria and fungi²². There was no association between parents illiteracy with pneumonia. In this study, majority of subjects had parents with low educational level (87.6%), and there were no differences between cases (89.5%) and controls (85.7%). There was no association between family income with pneumonia. In this study, majority of subject had low family income (68.1%), and there was no differences between cases (79.1%) and controls (57.14%). Differences likely due to selection of controls from the same community as cases make social economic condition at the same level. The association between the lack of maternal education and severe ALRI was inconsistent¹⁴. Individual factors (not exclusively breastfed) and environment factor (house ventilation, overcrowding, humidity, and kitchen smoke hole) was significantly associated with pneumonia among under five children in Purbalingga District.

CONCLUSION

Individual factor (not exclusively breastfed) and environmental factors (overcrowding, humidity, house ventilation, and kitchen smoke hole) was the important risk factors for pneumonia among under five children in Purbalingga District. Ventilation was dominant risk factor for developing pneumonia. Purbalingga District Health Office make letter of recommendation to Public Health Centers and

private service facilities (maternal and child hospitals, maternity clinics, and private midwives) to promote breastfeeding for infants aged 6 months. Advocate the community leaders to promote their people live in healthy homes. Public health centers give information about benefits of breastfeeding to pregnant women, mothers who had babies (0 to 6 month). Give information about healthy house that can lead to decrease the risk of pneumonia. Community to improve house ventilation, open windows and doors in the morning so can transport indoor air pollution outside the house to reduce humidity in the room, and make kitchen smoke hole equiped with exhauster could decrease the risk of respiratory infectious diseases.

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..... Winstein & Swartz³ conducted

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Sample References

Scientific Journal

1. *Standard journal article*

You CH, Lee KY, Chey RY, Menguy R. Electro-gastro-graphic study of patients with unexplained nausea, bloating and vomiting. *Gastroenterology* 1980; 79(2):311-14.

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