Original Article

Host factors related to pneumonia in children under 5 years of age

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Abstract

Background Pneumonia has been one of the serious problems for children under five in Indonesia. Imbalanced interactions among host factors, agents, and environments influence incidence of pneumonia.

Objective To determine the risks of the host related to the incidence of pneumonia in children aged 3-59 months in Pediatrics Department, Dr. Soetomo General Hospital during 2011-2012.

Methods This was a case control study on medical records of patients with respiratory infections in Pediatrics Department, Dr. Soetomo General Hospital. We grouped patients with pneumonia as the case group and patients with other respiratory infections as the control group. The data were statistically processed to calculate odds ratios and P values.

Results There were 326 subjects reviewed, 163 in the case group and 163 in the control group. Host factors that increased the risk of pneumonia were: low birth weight (OR=3.10; 95%CI 1.34 to 6.86), inadequate exclusive breastfeeding (OR=1.7; 95%CI 1.09 to 2.64), malnutrition (OR=3.44; 95%CI 2.12 to 5.58) and incomplete immunization in a certain period of age (OR=2.70; 95%CI 1.72 to 4.24). Existed comorbidity was unrelated to the incidence of pneumonia (OR=1.53; 95%CI 0.86 to 2.71).

Conclusion Low birth weight, inadequate exclusive breastfeeding, malnutrition, and incomplete immunization in a certain period of age increase the risk of pneumonia. **[Paediatr Indones. 2015;55:248-51]**.

Keyword: pneumonia, children, under five, host factors, case-control

Pneumonia in children is one of the health problems. Indonesia as a developing country is still facing the same problem. In 2006, in Indonesia there were 6 million children suffering from pneumonia, the same number as in Bangladesh.[1] Pneumonia is the second killer disease after diarrhea.[2] In 2010, the number of cases of pneumonia in young children throughout East Java Province reached 78.81% of all pneumonia cases.[3] Various host factors, environmental behavior, lack of socialization in the community and low awareness result in late handling in the health installations. As a result, the mortality rate of pneumonia in children under 5 years of age is still high in Indonesia.

This study aimed to analyze the risk factors, such as low birth weight (LBW), history of breastfeeding, nutritional status, immunization status, and co-morbidities in under five children with pneumonia.

Methods

This study was a case-control study on medical records

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of children aged 3-59 months with acute respiratory tract infections in the Pediatrics Department, Dr. Soetomo General Hospital from 2011-2012. We grouped the patients into 2 groups, the case group consisted of children with pneumonia, while children with other acute respiratory tract infections (non-pneumonia) were in the control group. Both groups had complete data of birth weight, nutritional status, history of breastfeeding, immunization status and co-morbidities.

Subjects who were breastfed only for 6 months categorized as exclusive breast feeding. Low birth weight infants were babies weighing less than 2500 gram at birth. Nutritional status measured by Z-score from *World Health Organization* (WHO), consisted of malnutrition/insufficient (<-2 SD) and well-nourished (between >-2 SD and <+2). Subject who did not get immunization as scheduled in *Rekomendasi Ikatan Dokter Anak Indonesia* classified as incomplete immunization.

We used simple random sampling method and formula for case control study.[4] The proportions of patients who exposed and developed pneumonia were taken from previous study (expand and developed pneumonia 27.2%; expand and did not develop pneumonia 14%).[5] Minimum sample requirements were 163 for each group.

Data collected in this study were name, gender, date of birth, height/length, birth weight, breastfeeding history, nutritional status, immunization status, and co-morbidities. Co-morbidities were defined as other than respiratory diseases that coexist with pneumonia.

We calculated odds ratios and P value with $P \leq 0.05$ was considered as statistically significant.

Results

We compiled 197 data for the case group and 190 data for the control group. There were 34 samples from the case group and 27 samples from the control group were excluded because of incomplete data. **Table 1** shows the majority of pneumonia patients were below one year old and mature.

Table 2 shows the distribution of the risk factors in the prevalence of pneumonia and non-pneumonia. The majority of pneumonia and non-pneumonia patients had sufficient birth weight. For patients with non-pneumonia, more than half of subjects had been exclusively breastfed. The number of patients with pneumonia who were well-nourished was greater than that who suffered from malnutrition; most

Table 1. Characteristics of study subjects in both groups

Characteristics	Pneumonia N=163	Non-pneumonia N=163	Total
Age, n(%)			
3-<13 months	110 (69.6)	48 (30.4)	158 (48.5)
13-59 months	53 (31.5)	115 (68.5)	168 (51.5)
Gender			
Boys	96 (50.3)	96 (49.7)	193 (59.2)
Girls	66 (49.6)	67 (50.4)	133 (40.7)
Prematurity			
Yes	27 (60)	18 (40)	45 (13.8)
No	136 (48.4)	145 (51.6)	281 (86.2)

Table 2. Distribution of the pneumonia risk factors

Risk factors	Pneumonia n(%)	Non-pneumonia n(%)	Total n(%)	OR (95% CI)	P value
Birth weight					
LBW	25 (73.5)	9 (26.5)	34 (10.4)	3.10	0.0053
Non-LBW	138 (47.3)	154 (52.7)	392 (89.6)	(1.34 to 6.86)	
History of breastfeeding					
Exclusive	80 (57.6)	59 (42.4)	139 (42.7)	1.7	0.0191
Non-exclusive	83 (44.4)	104 (55.6)	187 (57.3)	(1.09 to 2.64)	
Nutritional status					
Well nourished	97 (69.3)	35 (30.7)	114 (35)	3.44	<0.0001
Malnutrition/insufficient	84 (39.6)	128 (60.4)	212 (65)	(2.12 to 5.58)	
Immunization status					
Complete	91 (63.6)	52 (36.4)	143 (43.9)	2.70	<0.0001
Incomplete/never	72 (39.3)	111 (60.7)	183 (56.1)	(1.72 to 4.24)	
Had co-morbidities					
Yes	139 (51.9)	129 (48.1)	268 (82.2)	1.53	0.1493
No	24 (41.4)	34 (58.6)	58 (17.8)	(0.86 to 2.71)	

of the pneumonia patients did not get complete immunization as required within certain period of their age. Of all factors tested, only co-morbidities factor unrelated to the prevalence of pneumonia.

Discussion

The results showed that low birth weight was related to and also increased the risk of pneumonia. A previous study showed similar results where the risk factor of low birth weight towards the lower part of the respiratory system in developing countries was of OR=3.6 (95%CI 0.8 to 16.3; P<0.001).[6] Nutrition factor plays an important role since the effects appear indirectly but the impact is in longer term. A low birth weight baby will be born to a generation with nutrition deficiency.[7]

There was a close relation between breastfeeding and the occurrence of pneumonia. A study in Brazil by Boccolini revealed that the consecutive administration of mother's milk to a baby for about 6 months and continue the administration up to 1 (one) year had reduced the number of pneumonia occurences.[8] On the other hand, a meta-analysis by Jackson *et al* consisted 10 hospital-based studies showed that there was a significant relation between non exclusive breast milk and pneumonia with OR=2.34 (95%CI 1.42 to 3.88; P<0.001).[6] The breast milk contains a great deal of immunoprotective substances besides nutritious substances. They protect the baby since its own immune system is yet to be formed perfectly.[9]

The nutrition problem in Indonesia is still in desperate need of serious attention. *Riset Kesehatan Dasar (Riskesdas) 2013* (2013 Indonesian Basic Health Research) showed prevalence of malnutrition was up to 5.7%.[10] The malnutrition is the results of an inadequacy of nutrition which in turn will lower the ability of the body to fight various infectious diseases, one of which is pneumonia. In our study nutritional status had OR of 3.44 (95% CI 2.12 to 5.58; P<0.0001) which was the biggest one against other factors. A case control study conducted in Kenya by Onyango had similar results; namely there was a correlation between the state of malnutrition and pneumonia occurrence with OR=8.59 (95%CI 1.05 to 69.9; P=0.04).[11]

Incomplete administration of immunization is also closely related with the pneumonia occurrences and increases the risk of such occurrences. Another study in Bangladesh revealed similar results of OR=3.05 (95%CI 1.84 to 5.12; P<0,001).[12] In this study, most of the pneumonia disease were accompanied by co-morbidities. A study by Setyoningrum & Setyowati at the Regional Public Hospital Dr. Sutomo using a retrospective method showed that co-morbidities had significant relation to pneumonia occurrence (P=0.029).[13] It didn't mean that such factor may be eliminated since co-morbidities on pneumonia and non-pneumonia occurrences were quite high in number.

We conclude that low birth weight, inadequate exclusive breastfeeding, malnutrition, and incomplete immunization in a certain period of age increase the risk of pneumonia.

Conflict of interest

None declared.

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