Cyanosis as Mortality Risk among Children with Severe Pneumonia

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Abstract

Background: Pneumonia is the second leading cause of infant death in Indonesia. The mortality of pneumonia in children is associated with cyanosis, malnutrition, and age less than 4 months. The aim of this study was to determine the relationship between cyanosis, malnutrition, and age less than 4 months with the mortality of infant patients with severe pneumonia at Dr Hasan Sadikin General hospital.

Methods: A case-control study has been conducted using medical records of 80 patients with pneumonia at Dr. Hasan Sadikin General Hospital, period January 2007 to December 2013. The inclusion criteria were medical records consisting of information about infants with severe pneumonia, without comorbid diagnoses, who died during hospitalization. While controls were infants who have been discharged from hospital. The independent variables of this study were cyanosis, malnutrition, and age less than 4 months, while the dependent variable was the mortality. Data were analyzed by using univariate and bivariate analysis.

Results: The study reported that only cyanosis was associated with mortality. Malnutrition and age less than 4 months were not associated with mortality.

Conclusions: Cyanosis is known to be the only factor that has affected the mortality of infants with pneumonia who are hospitalized at Dr. Hasan Sadikin General Hospital. **[AMJ.2016;3(2):186–9]**

Keywords: Children, cyanosis, pneumonia

Introduction

Pneumonia stands for lung tissue-damaging inflammation caused by atypical infectious agents such as *M. pneumoniae, C. pneumoniae* and *L. pneumophila.*[1,2] According to the World Health Organization (WHO), severe pneumonia in children is indicated by chest indrawing. Pneumonia kills many children under-five with an annual incidence of 150.7 million cases worldwide.[3] Incidence of pneumonia in Southeast Asia's children is really high.[4] In 2013, theprevalence of pneumonia in Indonesia was 4.5%. According to the Indonesian Health Demographics Survey in 2009, West Java Province had a high incidence of pneumonia of more than 4%.[5]

Neonatal deaths   areascribed to 3 major causes: premature birth, sepsis, and pneumonia.[6] Pneumonia is deemed to be responsible for the loss of lives at least in 2 million children annually (20% of all child deaths) with 70% of all deaths occuring in Africa and Southeast Asia.[7] High incidence of deaths among children under-five are associated with many factors, e.g. cyanosis, hepatomegaly, inability to eat, malnutrition, mental status changes, prolongation of sickness duration, comorbid chronic diseases, and age less than 4 months.[8,9] Those associations have been confirmed by multiple studies abroad however, in Indonesia, particularly in West Java, such associations are still open to dispute. The high incidence of deaths among children under-five due to pneumonia and lack of studies investigating the validity of the above-mentioned associations become the background of this study. The objective of this study was to investigate the influence of cyanosis, malnutrition, and age of less than 4 months on death among children with severe pneumonia. The fore-mentioned factors were chosen as research variables because the data were always recorded in thepatient's medical

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Table 1 Frequency of Cyanosis, Malnutrition, and Age of Less than 4 Months among Cases and Controls

Risk Factors		Patient Category			
		Case (n=4)	(%)	Control (n=40)	(%)
Cyanosis	Yes	7	17.5	1	2.5
	No	33	82.5	39	97.5
Malnutrition	Yes	25	62.5	21	52.5
	No	15	37.5	19	47.5
Age less than 4 months	Yes	6	15	4	10
	No	34	85	36	90

records while other factors e.g. hepatomegaly, mental status changes, comorbid chronic diseases, and inability to eat were rarely recorded.

Hopefully, the results of this study could aid clinicians in formulating prognosis for children with severe pneumonia. This study should also provide greater details on clinically deteriorating factors among children with severe pneumonia.

Methods

This study had employed a case-control study design utilizing medical records of pediatric in patients with severe pneumonia at Dr. Hasan Sadikin General Hospital from January 2007 to December 2013. The cases in this study were pediatric inpatients who died of severe pneumonia, while control patients were also pediatric in patients with severe pneumonia but were later discharged.

The samples were medical records of pediatric patients who fulfilled the inclusion criteria. The inclusion criteria in this study for thecase group was complete medical records consisting of information about patients with severe pneumonia who had been treated at the Department of Pediatrics of Dr. Hasan Sadikin General Hospital from January 2007 to December 2013; maximum age of 5 years; and

had died, meanwhile the inclusion criteria for the control group was similar to the case group however the patients werelater discharged. The implemented exclusion criteria were medical records consisting ofinformation about pediatric inpatients with comorbidities. The simple randomized sampling was used and the study eventually involved 80 patients who were divided into equal groups of cases and controls.

The data were then subjected to a chi-squared statistical test. All the statistical calculations were executed using statistics software

Results

The results of this study were presented in tables displaying the frequency of the risk factors among patients and the relationship between each risk factor and mortality.

Table 1 demonstrates that cyanosis was only rarely encountered among the study population as only a meager 10% of the population reported such finding. Of such lean number, the majority of cyanosis was encountered in those who died of pneumonia (cases). Patients with malnutrition were higher in number than those without but the difference in their numbers was not significant. Only a few of the patients included in the study

Table 2 Relationship between Cyanosis and Mortality

Cyanosis	Mortality				P-value*
	Yes (n=40)		No (n=40)		
	f	%	f	%	
Yes	7	17.5	1	2.5	0.025
No	33	82.5	39	97.5	

Note: *Chi-squared test

Table 3 Relationship between Malnutrition and Mortality

Malnutrition	Mortality				P-value*
	Yes (n=40)		No (n=40)		
	f	%	f	%	
Yes	25	62.5	21	52.5	0.366
No	15	37.5	19	47.5	

Note: *Chi-squared test

were less than 4 months old and out of the few, the case patients contributed more than the control patients (15% against 10%).

Furthermore, theChi-squared test was then used to analyze the relationship between cyanosis and children mortality. A p-value of 0.025 established that the hypothesis of a relationship between cyanosis and mortality among children with pneumonia was significant.

The Chi-squared test was also used to analyze the relationship between malnutrition and mortality among children. A p-value of 0.366 failed to establish any significant association and the hypothesis of malnutrition influencing mortality was not significant.

A p-value of 0.499 failed to establish such influence and the hypothesis of such young age having an influence on mortality was not significant.

Discussion

According to Djelantik et al.[9] and Lutala et al.[10], age of less than 4 months and cyanosis [95% CI, 0.21 (0.10-0.42), p-value = 0.00] are associated with deaths among patients with pneumonia. Deaths due to pneumonia can be reduced by strict attention to the fore-mentioned risk factors.[4,10] This study has investigated the association between cyanosis and deaths among children with pneumonia and the statistical analysis revealed that such association in fact existed among patients at Dr. Hasan Sadikin General Hospital which wasproven by the p-value of 0.025.

A different finding was reported concerning the child's age. A p-value >0.05 between age of less than 4 months and mortality among children suggested that the two variables lack definitive association. Such finding might have been due to the limited number of patients of such age being referred to and treated at Dr. Hasan Sadikin General Hospital. This finding was also at odds with the current data that mortality due to pneumonia among children under-five in Indonesia was still high. Future studies with larger populations involving multiple centers are deemed necessary to produce more accurate findings.

Moreover, Scott et al.[12] revealed in their study that mortality due to pneumonia could be lessened by improvements in nutrition. Meanwhile, Caulfield et al.[13] who demonstrated that poor nutrition was responsible for many pneumonia deaths also confirmed such revelation. Another study in India performed by Ghimire et al.[14] four years ago demonstrated that malnutrition has increased the proportion of deaths among patients with pneumonia. In addition, according to Divyarani et al.[11], low birth weight among children under-five is also associated with pneumonia.[11-14] However, all of these findings were at odds with the findings of this study. According to the data, no significant relationship could be established between malnutrition and mortality among pediatric inpatients at Dr. Hasan Sadikin General Hospital. Such finding could have been due to malnutrition being so widespread among both case and control patients and this presented a potential bias that may corrupt the findings of

Table 4 Relationship between Age Less than 4 Months and Mortality

Age less than 4 months	Mortality				P-value*
	Yes (n=40)		No (n=40)		
	f	%	f	%	
Yes	6	18	4	10	0.499
No	34	85	36	90	

Note: *Chi-squared test

this study. On one side, malnutrition presents itself as a risk factor but on the other side, it may also act as a comorbidity that worsens the prognosis of a child with pneumonia. In some way, a study performed by Yudhi et al.[15] in the province of West Nusa Tenggara resonated with this study's findings as they revealed in 2010 that most pediatrics patients with pneumonia under their care actually had normal nutritional status.[15]

In conclusion, cyanosis has a significant association with mortality among children with pneumonia at Dr. Hasan Sadikin General Hospital. Both malnutrition and age of less than 4 months show no such association.

This study though is not without limitations. Lack of sample is attributable to the mostly incomplete data and sometimes lost medical records. Thus, it is suggested that further studies should pay close attention to the confounding factors, such as comorbidities, geographic location, completeness of medical records, and study methods. In addition, better computerization of the medical records should be pursued to minimize both the inaccuracies and the losses of medical records at Dr. Hasan Sadikin General Hospital.

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