



## Inhalation with bronchodilator combination effective in reducing length of hospital stay in children with pneumonia

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### KEYWORDS

Inhalation;  
Length of hospital stay;  
Pneumonia

### Abstract

**Objective:** This study aimed to examine the correlation between inhalation therapy and length of hospital stay in children under age of five with pneumonia.

**Method:** This cross-sectional study included 102 consecutive patients (secondary data) with pneumonia. The patients were divided depending on the type of therapy they received: Group I used inhalation therapy with bronchodilator  $\beta$ -agonist + NaCl 0,9%, Group II used inhalation therapy with bronchodilator  $\beta$ -agonist and anticholinergic + NaCl 0,9%, Group III used inhalation therapy with NaCl 0,9%, and Group IV used no inhalation therapy.

**Results:** The study results showed a significant correlation between the use of inhalation therapy and the length of hospital stay ( $p = 0.000$ ) after being controlled age, leucocyte count, and the type of antibiotic therapy. However, there was no significant correlation between the use of inhalation therapy and the length of hospital stay in children under the age of five with pneumonia after sex and oxygen therapy being controlled.

**Conclusions:** Inhalation therapy with a combination of bronchodilator  $\beta$ -agonist and anticholinergic + NaCl 0.9% and with bronchodilator  $\beta$ -agonist + NaCl 0.9 % are the two most effective treatments with which to reduce the length of hospital stay in toddlers with pneumonia.

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### Introduction

Pneumonia still has a high rate of prevalence and remains one of the leading causes of deaths among toddlers worldwide, especially in developing countries. The World Health Organization (WHO) estimates that there are 156 million cases of pneumonia afflicting children under five years old annually. Pneumonia is responsible for 15% of deaths among children under five years old, accounting for 922 thousand deaths in 2015<sup>1,2</sup>.

According to a survey conducted by the Indonesian Health Ministry in 2013, the prevalence rate of pneumonia in all age groups throughout Indonesia increased from 2.1% in 2007 to 2.7% in 2013. In terms of age groups, children aged 1 to 4 years have the highest rate of pneumonia prevalence, at 18.5%<sup>3</sup>. Of all Indonesian provinces, West Nusa Tenggara Province has one of the highest pneumonia prevalence rates among children under five years old. It was estimated that in the province, as many as 54,220 children under five years old in 2014 were afflicted by pneumonia

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but that only 26,631 (49.12%) were treated by professional health workers<sup>4</sup>.

One of the most troubling symptoms experienced by pneumonic children is respiratory tract blockage due to mucus accumulation. The respiratory tract can be cleared of mucus accumulation by performing various medical interventions, one of which is inhalation therapy. Inhalation therapy can help remove the airflow obstruction and reduce the mucus accumulation in the patient's respiratory tract<sup>5</sup>. In spite of the fact that inhalation is performed on most patients, some medical professionals do not recommend it for the routine management of hospitalized children<sup>6</sup>.

The use of various therapeutic interventions may influence a patient's length of hospital stay. Appropriate and effective treatment is necessary to avoid recurrent infections, which can prolong the patient's duration of treatment at the hospital and thus increase treatment costs<sup>7</sup>. The purpose of this research project was to examine the correlation between inhalation therapy and length of hospital stay among pneumonic children under five years old.

## Methods

This study applied a descriptive-analytical research design and a cross-sectional approach. This study used secondary data which were obtained from the medical records of patients treated at the hospital within the one-year period from May 2015 to May 2016 and then written manually on the data forms. The respondents were selected using the consecutive sampling technique. The research sample consisted of 102 children under five years old who had been treated at the P3 Regional Hospital and had their treatment documented in the hospital's medical records. Our inclusion criteria were that (1) the patients were under five years old (aged 0 to 59 months) and (2) the patients were diagnosed with pneumonia and treated at the hospital. Our exclusion criterion was that the patients were treated at the hospital and diagnosed with pneumonia coupled with other infectious diseases, such as congenital heart disease or immunodeficiency disease. Samples were obtained using the consecutive sampling technique. The data were analyzed using the univariate and bivariate analyses with the Chi-square statistical test, which was performed using computer software. This research project was approved by the Ethics Committee of the Faculty of Nursing of Universitas Indonesia.

## Results

The characteristics of the respondents showed that most of this study participants were male (70 children, or 68.6%). Their median age was 11 months. The youngest was 1 month old, and the oldest was 59 months old. Fifty-six samples (54.9%) had leucocytes  $\leq 14,000/\text{mm}^3$ . Most samples (71 children, or 69.6%) received second-line antibiotics, and the median oxygen therapy volume was 1 liter/minute. Twenty-one samples (20.6%) did not receive any inhalation therapy at all; 31 (30.4%) samples were treated with inhalation therapy using NaCl 0.9%, 24 samples (23.5%) were treated with inhalation therapy using  $\beta$ -agonist bronchodilator + NaCl 0.9%, and 26 samples (25.5%) were treated with inhalation therapy using a combination of  $\beta$ -agonist and anticholinergic bronchodilator + NaCl 0.9%. Fifty-six (54.9%) participants had a long treatment duration (> 5 days), whereas 46 (45.1%) participants underwent a short treatment duration. (Table 1)

Table 1 demonstrated that the administration of inhalation therapy using a combination of  $\beta$ -agonist and anticholinergic bronchodilator + NaCl 0.9% resulted in shorter treatment durations (80.8% of cases) as compared to other types of inhalation therapy or the absence of inhalation therapy. This result proves that there is a significant correlation between the administration of inhalation therapy and the duration of treatment ( $p = 0.000$ ).

The results of the bivariate analysis of the confounding and dependent variables showed correlations between the age, number of leucocytes, and the type of antibiotics prescribed ( $p < 0.05$ ), while there was no significant correlation between the sex and oxygen therapy volume ( $p > 0.05$ ).

## Discussion

Pneumonic children in this study received different intervention treatments for the purpose of clearing their respiratory tracts of mucus deposits. The treatments consisted of inhalation therapy using NaCl 0.9% only, using  $\beta$ -agonist bronchodilator + NaCl 0.9%, and using a combination of  $\beta$ -agonist and anticholinergic bronchodilator + NaCl 0.9%, as well as treatments that did not involve any inhalation therapy at all. The results indicated that in general, children who received inhalation therapy had shorter treatment durations than those who did not receive inhalation therapy at all.

**Table 1** Correlation between the Administration of inhalation therapy and the length of hospital stay for pneumonic children

Variable	Length of hospital stay						<i>p</i>
	Long		Short		Total		
	n	%	n	%	n	%	
<i>Administration of inhalation therapy</i>							0.000
Not treated with any type of inhalation therapy	17	81.0	4	19.0	21	100	
NaCl 0.9%	24	77.4	7	22.6	31	100	
$\beta$ -agonist bronchodilator + NaCl 0.9%	10	41.7	14	58.3	24	100	
Combination of $\beta$ -agonist and anticholinergic bronchodilator + NaCl 0.9%	5	19.2	21	80.8	26	100	

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