



The combination of nebulization and chest physiotherapy improved respiratory status in children with pneumonia

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KEYWORDS

Nebulization;
Chest physiotherapy;
Respiratory status;
Pneumonia

Abstract

Objective: There is controversy regarding the effectiveness of chest physiotherapy to solve airway obstruction problems experienced by children younger than five years of age with pneumonia. The aim of this study was to determine the effectiveness of chest physiotherapy and nebulization on the respiratory status of these children.

Method: This study was quasi-experimental with a pre- and post-test nonequivalent control group design. Thirty-four respondents selected by consecutive sampling were divided into two groups: one that received nebulization and one that received nebulization with chest physiotherapy. The independent t-test was used to analyze the effect of chest physiotherapy and nebulization on the respiratory status of children younger than age five with pneumonia.

Results: There was a significant mean difference in heart rate, respiratory rate, and oxygen saturation between the control and intervention group ($p = 0.000$). Despite the correlation between age and heart rate, other characteristics (nutritional status, exclusive breast-feeding, vaccination, the length of illness, and the content of nebulization medication) had no effect on heart rate, respiratory rate, and oxygen saturation.

Conclusions: The combination of nebulization and chest physiotherapy is more effective than nebulization only. It is important to reconsider the combination of nebulization and chest physiotherapy to overcome airway obstruction problems.

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Introduction

Infant mortality is one of the parameters of a country's health. In 2015, approximately 922,000 (15%)¹ deaths among children younger than age five were caused by pneumonia. In the same year, pneumonia was the second-highest cause of death among infants and toddlers in Indonesia, with diarrhea being the first. It is also listed as one of the ten most dangerous diseases in health facilities each year². In 2013 in Indonesia,

approximately 14%³ of children's deaths were due to pneumonia. This shows that pneumonia is still the main health concern within communities, and it is one of the factors contributing to the high child mortality rate in Indonesia².

Between 7-13% of pneumonia cases in the community become severe and require hospitalization⁴. Children with pneumonia encounter various problems during hospitalization (e.g., respiratory distress due to increasing secretion production)^{5,6}. Children with pneumonia often experience

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difficulty releasing secretions because their cough reflexes are weak at their young age⁵. Alternative treatments that can overcome the accumulation of secretions are nebulization and chest physiotherapy⁷. The study showed that providing nebulization in the intensive care unit to patients with atelectasis and pneumonia could prevent blockage in the respiratory tract due to excessive sputum production⁸.

Giving chest physiotherapy is still a controversial issue. The previous study demonstrated that chest physiotherapy was not effective^{9,10}. Nevertheless, chest physiotherapy continues to provide benefits by reducing several respiratory symptoms in children, such as coughing and difficulty breathing.

Another study explained that chest physiotherapy could in fact offer some benefits. A study on the impact of chest physiotherapy in children showed that it reduced the number of days hospitalized for a child with no record of chronic respiratory illness¹¹. Another study showed how a child could not yet coordinate the release of secretions through passive techniques, such as as percussion, vibration, and postural drainage—more commonly known as conventional physical therapy (CPT)¹². Conversely, another study showed that CPT could reduce secretions and increase oxygenation¹². Based on these findings, this study aimed to determine the effectiveness of chest physiotherapy and nebulization on the respiratory status of children under the age of five with pneumonia.

Method

This study used a quasi-experimental design with pre- and post-tests and nonequivalent control group design, which includes two groups. The respondents were selected using consecutive sampling techniques. The samples of this study were children ages 0-59 months, consisting of 17 respondents in the control group and 17 respondents in the intervention group. The instruments used to collect data in this study were observation sheets, pulse oximetry, and a respiratory rate timer.

Children's heart rates, respiratory rates, and oxygen saturations were measured for twenty minutes before the treatment was given. The respondent had just received nebulization therapy for the first time; this procedure was followed by one-time nebulization (based on standard operational procedure) for a specific time period, depending on the characteristics of the medicine in both groups. The

study assistant (physiotherapist) was the one performing the chest physiotherapy. Chest physiotherapy was given for thirty minutes in the treatment room. Chest physiotherapy was given before meals or 1 to 1.5 hour after meals to minimize vomiting. After treatment was given, the study assistant noted the respiratory status on the observation sheet, including heart rate, respiratory rate, and oxygen saturation. The measurement was undertaken after 20 minutes of treatment¹³. The study was approved by the Ethics Committee of the Faculty of Nursing of Universitas Indonesia and Hospital. The data analyses were univariate, bivariate, and multivariate using the independent t-test.

Results

The average age of the respondents in the intervention group was younger (13.24 months) than that of the respondents in the control group (22.65 months). The average length of sickness of respondents in the control group was higher than that of respondents in the intervention group by 4.76 days and 4.47 days.

With regard to nutritional status, there were 76.5% in the control group had poor nutritional status, while 64.7% in the intervention group had poor nutritional status. There were more respondents in the control group who were breast-fed exclusively (70.6%), whereas in the intervention group, more respondents were not exclusively breast-fed (58.8%). The immunization status in both groups that did not receive complete immunization was lower (by 11.8% and 17.6%, respectively) than the ones who did receive complete immunization. The classification of pneumonia in the control group and the intervention group was 100%.

Respondents in the control and the intervention groups did not use oxygen. The content of nebulization in the control group (52.9%) and the intervention group (58.8%) that received bronchodilation, mucolytics, and NaCl was higher than that of the group that received only bronchodilation and mucolytics.

As shown in Table 1, heart rate, respiratory rate, and oxygen saturation before and after treatment increased in both groups with higher increases in the intervention group. This result showed that there was a difference in heart rate, respiratory rate, and oxygen saturation before and after

Group	Variable	Average		SD		Mean difference (95%CI)	p value
		Before	After	Before	After		
Control	HR	132.06	129.65	14.515	12.918	2.41	0.000
	RR	48.94	46.65	4.802	4.769	2.29	0.000
	SpO ₂	92.24	93.29	1.348	1.312	1.05	0.000
Intervention	HR	139.35	120.53	12.619	13.370	18.82	0.000
	RR	55.53	41.06	5.113	5.695	14.47	0.000
	SpO ₂	92.18	97.41	1.237	0.939	5.23	0.000

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