International Journal of Research in Medical Sciences
Rosadi R et al. Int J Res Med Sci. 2022 Apr;10(4):949-952
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20220991

Case Report

The effectiveness of physiotherapy in children with pneumonia: a case study report

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Received: 15 February 2022
Accepted: 04 March 2022

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ABSTRACT

The purpose of this study was to determine the results of giving chest therapy to children with pneumonia and whether they could reduce the symptoms that occur due to pneumonia. A case study of a 12-year-old child with bacterial pneumonia, therapy was carried out 3 times a week for 8 weeks, measurements using the borg scale and anthropometric measurements of thoracic expansion. Chest therapy was given for 20 minutes, infrared for 15 minutes, and breathing exercise for 8 times 3 sets. After 8 weeks of therapy, the symptoms experienced were still there, such as shortness of breath but reduced and the patient's complaints were very rare, indicating the improvement of the patient's quality of life. Chest therapy can show improvement in patients with pneumonia with reduced symptoms and a better quality of life for patients.

Keywords: Pneumonia, Chest therapy, Breathing exercise

INTRODUCTION

Pneumonia is an inflammation of the parenchyma of the lungs. The majority are caused by microbes (viruses/bacteria), with a few exceptions (aspiration, radiation etc.).[1] The most crucial question in bacterial pneumonia is what caused it (virus or bacteria). Pneumonia is commonly thought to start with a viral infection and subsequently progress to a bacterial infection.[2] Clinically, it's difficult to tell the difference between bacterial and viral pneumonia in youngsters. Similarly, radiological and laboratory tests revealed no major changes. Bacterial pneumonia, on the other hand, has a rapid onset, a strong cough, the patient appears toxic, leukocytosis, and significant abnormalities on radiological imaging.[3] The pattern of pneumonia-causing bacteria frequently varies depending on the patient's age range. *Streptococcus pneumoniae, Hemophilus influenzae, Staphylococcus* aureus, group B *Streptococci*, as well as atypical chlamydia and mycoplasma bacteria, are all relevant bacteria in pneumonia.[2]

Many factors, including the child's unique characteristics, the behavior of the parents (mother), and the surroundings, can contribute to the rising incidence of pneumonia in children.[4] The physical environment of the home that does not satisfy health requirements, as well as the behavior of consuming fuel, can raise the risk of diseases including tuberculosis, cataracts, and pneumonia. Densely crowded housing, indoor air pollution caused by the use of solid fuels (firewood/charcoal), and parental smoking behavior are all variables that can make children prone to pneumonia.[5]

The high mortality rate of pneumonia in children under the age of five in underdeveloped nations is due to a number of reasons. Infancy pneumonia, low birth weight (LBW), lack of vaccinations, lack of sufficient breastfeeding, malnutrition, vitamin A insufficiency, high prevalence of pathogenic bacteria colonization in the nasopharynx, and excessive exposure to air pollution are all risk factors (industrial pollution or cigarette smoke).[4,5]

Symptoms of generalized infection, such as fever, headache, restlessness, malaise, decreased appetite, gastrointestinal complaints such as nausea, vomiting, or diarrhea; extrapulmonary infection symptoms, such as cough, shortness of breath, chest retractions, tachypnea, nostrils, air hunger, moaning, and cyanosis; and symptoms of respiratory disorders, such as cough, shortness of breath, chest retractions, tachypnea, nostrils, air hunger, moaning.[1,3]

Chest therapy, often known as chest physiotherapy, is an important part of the treatment of most respiratory illnesses in children.[6] It is also utilized for children who have chronic respiratory or neuromuscular problems. The major purpose of children's chest physiotherapy is to assist eliminate tracheobronchial secretions, which reduces airway resistance, improves gas exchange, and makes breathing easier. When practicing treatments that require manual handling, such as manual vibration, chest compressions, and percussion, chest physiotherapy can be done alone or with the assistance of another person (physiotherapist, parent, or caregiver).[7]

Mechanical interventions based on respiratory physiology are used therapeutically in chest physiotherapy. Mucociliary clearance, re-expansion, and ventilation can all be improved by changing your body position. Other methods include using breath control to change the flow of air, or using equipment to maintain the airway clean and promote ventilation by keeping it open during expiration.[8]

Shortness of breath, fatigue, and inability to carry out daily living activities are the most common symptoms of pneumonia in children. Thus, this study aimed to investigate whether giving chest therapy intervention to pneumonia patients might influence Borg scale and thorax expansion, and also enhancing their quality of life.

CASE REPORT

This case involved "Y" who was 12 years old and had a history of premature birth at the age of 6 months of pregnancy. After that, the patient's life was normal, until he developed a sore throat and fever when he was 2 years old. Even though he was fed soy milk and milk every day, the child's weight did not increase. When parents see a doctor, a thorough check is recommended, and blood clots in the lungs and heart are found to be swollen. The patient also had a delay in walking, and by the time he was almost two years old, he could only walk. The patient could walk when he first entered the kindergarten, but he couldn't walk for very long or was fatigued. When he was tired, his face turned blue, he had chest pain, and he had shortness of breath.

When determining the degree of shortness of breath, the borg scale is used. The borg scale evaluates the degree of shortness of breath when performing tasks. The borg scale ranges from 0 to 10, with the higher the number, the more severe the shortness of breath. A score of 0 indicates no shortness of breath, while a score of 10 indicates extreme shortness of breath. There is a value of 8 in patient An Y, which is quite heavy, since when undertaking excessive activities, An Y frequently gets shortness of breath, which must be addressed, and if not, it might result in bluish hue and chest pain.

The measurement of thoracic expansion, in addition to the Borg scale, is used to determine the development of the thorax and whether there is a disruption in the development of the thorax when breathing. The midline is the instrument utilized, and there are two thoracic measures, one in the axilla and one in the xhyphoid, each with normal and powerful breathing. The spinous process of the fifth thoracic vertebra, the midpoint of the clavicle line, and the three intercostal gaps are examined anatomically. The xiphoid process and the spinous process of the 10th thoracic vertebra are utilized as anatomical markers for the lower xiphoid.[9]

On normal breathing, Child "Y" had a thoracic axillary expansion of 25 cm and an expiration of 24.5 cm, however on forceful inhalation, he had a thoracic axillary expansion of 27 cm and an expiration of 24 cm. While regular breathing allows for 22 cm of inspiration and 21 cm of expiration for xhyphoid thoracic expansion, strong breathing allows for 23 cm of inspiration and 20 cm of expiration for xhyphoid thoracic expansion.

Because the exercises and modalities are interconnected, chest therapy has vibration, postural drainage for sputum production, and then an effective cough is added, but before that is done, giving infrared to relax the diaphragm muscles and also giving a liquid effect on the sputum, and then doing breathing exercises which are interconnected, the provision of chest therapy, infrared, and breathing exercises is carried out simultaneously from the first session to six sessions or the last, because the exercises and modal.

Table 1: Physiotherapy program.

Duration	8 weeks of physiotherapy intervention
Frequency	3 times a week
Intensity	30-40 minutes every session
Intervention	Infra red therapy
	Breathing exercise
	Chest therapy

In patients with pneumonia, such as child "Y," there is an increase in carrying out activities, but symptoms can still arise even though they diminished dramatically, which is usually when undertaking activities where there is the most shortness of breath now that can be handled alone.

It has been demonstrated that chest physiotherapy, infrared treatment, and breathing exercises can assist relieve symptoms but not repair pneumonia in children.

According to some research, pneumonia in children cannot be treated but can only be reduced in severity. It is hoped that after the physiotherapy intervention, the patient will be able to gradually enhance his living activities and even participate in low-impact sports in order to maintain his quality of life in the future.

Table 2: Expansion thorax measurement of the patients during baseline, 4 weeks and 8 weeks follow-up.

Expansion thorax measurement	T0		T1 (4 weeks follow up)		T2 (8 weeks follow up)	
	Inspiration	Expiration	Inspiration	Expiration	Inspiration	Expiration
Upper expansion-axila (cm)	27	27.5	27	26	28	25
Lower expansion-xyphoid (cm)	23	22	23	22	24	21
Borg scale	8		7		5	
Heart rate	80		85		80	
Respiratory rate	16		16		14	
SpO_2	95		96		98	

DISCUSSION

Pneumonia is one of the most common diseases that causes death in infants, children, and adults. It also causes a loss in quality of life, such as diminished social activities and inability to carry out everyday tasks due to the symptoms that emerge.

In a study conducted by, there was a decrease in pneumonia mortality after treatment and also chest therapy, where the decrease in pneumonia mortality was low, but the time of hospital stay did not reduce, but blood oxygen levels increased after chest physiotherapy was provided.[8,10] Chest physiotherapy is important in the treatment of most respiratory diseases, and is used for children with chronic respiratory or neuromuscular diseases.[11,12] The main goal of chest physiotherapy for children is to help clear tracheobronchial secretions, thereby reducing airway resistance, increasing gas exchange, and making breathing easier.[2,6]

Mechanical interventions based on respiratory physiology are used therapeutically in chest physiotherapy.[13] Mucociliary clearing, re-expansion, and ventilation of the lungs can all be improved by changing your body position.[2,14] Another strategy involves using breath control or devices to keep the airway clean and increase ventilation by keeping the airway open during expiration, as described by.[5,15] Infrared is applied for 10 to 15 minutes in the chest or back area, depending on the thorax results, and can be combined with postural drainage with the body position adjusting the results of the chest X-ray, followed by continued chest physiotherapy for 3-5 minutes for each segment with postural drainage, vibration, and percussion, followed by breathing exercise 8 times in two sets.[12]

Only children over the age of eight are eligible for autogenic drainage, which is based on active or passive aided control of autogenic drainage of airflow and lung volume-based respiratory rate.[16] Because it does not involve active participation, assisted autogenic drainage is a modified version of autogenic drainage used for newborns and young children.[8,17]

Manual compression of the thorax during expiration and ceasing at the end of expiration is used in the thoracic squeezing technique to enhance pulmonary secretion movement, facilitate active inhalation, and increase alveolar ventilation. The reason behind this technique is that it has a compressive impact on the airways, which increases airflow velocity and hence improves mucus transfer.[2,5,6]

Among the advantages of chest physiotherapy are the removal of inflammatory exudate and tracheobronchial secretions, the reduction of airway blockages, the reduction of airway resistance, the increase of gas exchange, and the reduction of breathing work.[18]

Another study found that children who received chest physiotherapy improved their respiratory rate and arterial oxygen saturation more than those who did not.[14,15] According to research conducted by, there was a substantial difference in respiration rate per minute before and after treatment. The treatment used in this trial was a mix of chest physiotherapy and infrared therapy.

CONCLUSION

On pneumonia, infrared physiotherapy and chest physiotherapy (Deep breathing, postural drainage, clapping, vibration, and effective cough) have an effect on decreasing shortness of breath, decreasing symptoms that appear, and improving the quality of life of patients. It can be seen from borg scale that the patient's shortness of breath when carrying out activities decreased, though it was not significant due to time constraints.

ACKNOWLEDGMENTS

The authors would like to thank physiotherapy department faculty of health science university of

Muhammadiyah Malang and participant for the support for this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Rosadi R, Algifari MF, Wardojo SSI, Rahmanto S, Yuliadarwati NM. The effectiveness of physiotherapy in children with pneumonia: a case study report. Int J Res Med Sci 2022;10:949-52.