



Article

**The Effect Of Chest Percussion On The Reduction Of Additional Breath Sounds In Pneumonia Patients In The Bougenville Room Of Rumah Sakit dr. Haryoto Lumajang**

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A B S T R A C T

Pneumonia is an acute inflammation of lung tissue caused by microorganisms, symptoms that appear such as increased temperature and can be accompanied by seizures, restlessness, cyanosis, shortness of breath, and productive coughing, so that proper treatment is needed to remove sputum that accumulates in the airways, one of which is chest physiotherapy with the Chest Percussion method. The purpose of this study is to determine the effect of Chest Percussion on the decrease in additional breath sounds in pneumonia patients in the bougenville room of Rumah Sakit dr. Haryoto Lumajang. The design of this study was a pre-experimental study using a one-group pretest-posttest approach using standard operating procedures on chest percussion and observation sheets for additional breathing sounds. The statistical test used was the wilcoxon test, with a research sample of 31 respondents taken by the accidental sampling method from July 31 until August 30, 2024. The results in this study showed that of the 20 (64.5%) respondents with missing ronkhi when coughing/inhaling before the Chest Percussion action, there were 18 (90%) respondents who at the time after the procedure changed to sound smooth ronkhi and the remaining 2 (10%) did not experience any change. Meanwhile, in 11 (35.5%) respondents who at the time before the Chest Percussion action heard a smooth ronkhi sound, 11 (100%) of the respondents after receiving the action changed to clear. The results of the Wilcoxon statistical test obtained a p-value of 0.000 ( $p < 0.05$ ) which means that there is a significant influence between Chest Percussion on additional decrease of breathing sounds in pneumonia patients. The results of this study can be concluded that Chest Percussion can reduce sputum in pneumonia patients, with reduced sputum the sound of the ronkhi in pneumonia patients can be reduced. It can be recommended for hospitals that Chest Percussion is a guideline in treating pneumonia with additional sounds.

**I. INTRODUCTION**

Pneumonia is an acute inflammation of the lung tissue caused by microorganisms

(fungi, bacteria and viruses). Pneumonia can cause mild to severe symptoms. Pneumonia is also known by another term, wet lungs. In

this condition, pneumonia causes inflammation of the air sacs (alveoli) in one or both lungs. As a result, the alveoli are filled with fluid or pus, making it difficult for pneumonia sufferers to breathe. (Ministry of Health of the Republic of Indonesia, 2022; Wibowo et al., 2023). Meanwhile, according to the World Health Organization in 2022, pneumonia is a form of acute respiratory infection that is most often caused by viruses or bacteria. This can cause mild to life-threatening illnesses in people of all ages, but pneumonia is the leading cause of infectious death in children worldwide. Pneumonia is the leading cause of death and infection in children worldwide. Pneumonia killed 740,180 children under 5 years of age in 2019, accounting for 14% of all deaths in children under 5 years of age but 22% of all deaths in children aged 1 to 5 years. Pneumonia affects many children and is the leading cause of death in South Asia and sub-Saharan Africa. Children can be protected from pneumonia, it can be prevented with simple interventions, and it can be treated at low cost (WHO, 2022). In Indonesia, 5,386 toddlers (19.13%) died in the age range of 29 days-11 months (post-neonatal), 2,506 toddlers (8.9%) died in the age range of 12-59 months, and pneumonia was the highest cause of post-neonatal toddler mortality, which was 14.5% (Ministry of Health of the Republic of Indonesia, 2021). According to the Central Statistics Agency (BPS), 42.83% of toddler deaths in the 12-59 month age range were due to parasitic infections, other causes of death were pneumonia 5.05%, diarrhea 4.5%, drowning 0.05%, and other factors 47.41% (Kusnandar, 2021). Globally, premature birth, pneumonia, diarrhea, and malaria are the main causes of death in children under the age of five. The East Java Health Office noted that at least 45,041 toddlers in the province experienced acute lower respiratory tract infections or pneumonia almost throughout 2023 (Central Statistics Agency of East Java Province, 2023). In Lumajang Regency, the prevalence of pneumonia was recorded at 977 cases in 2023. From the medical record data of Rumah Sakit dr. Haryoto Lumajang in 2023, it was found that inpatient visits to the Bougenville Room in November were 296 patients, with inpatient visits for Pneumonia

patients of 20 patients in November. Based on a preliminary study conducted by researchers on December 10, 2023, it was found that in December there were 5 pediatric patients with pneumonia cases, the 5 patients had been given pharmacological measures in the form of antibiotics according to advice and inhalation therapy. After pharmacological therapy was given, 3 of the 5 patients were given additional non-pharmacological therapy, namely chest percussion, after being evaluated on the 3rd day, the 3 patients compared to the 2 patients who only received pharmacological therapy had cleaner additional breath sounds (ronchi).

Pneumonia is caused by bacteria, viruses, fungi, and foreign objects. Bacteria enter through the upper respiratory tract to reach the bronchioles then enter the alveoli and surrounding areas which then cause a severe inflammatory reaction accompanied by increased edema in the alveoli (Sukma, 2020). Children with pneumonia will be found to have signs and symptoms such as sudden fever which can be accompanied by seizures, restlessness, cyanosis, shortness of breath, nasal flaring, and productive cough. Physical examinations that are usually performed for this disease will find vesicular and weakened breath sounds, fine, loud, and wet rhonchi (Alya Syafiati & Nurhayati, 2021). Therefore, proper treatment is needed to remove phlegm or sputum that accumulates in the respiratory tract, one of the appropriate nursing interventions used is effective chest physiotherapy (Annisa, 2020). Chest physiotherapy is a collection of techniques or actions to remove sputum that are carried out either independently or in combination so that there is no accumulation of sputum which results in blockage of the airways which causes additional breath sounds and complications of other diseases (Jauhar, 2013). There are various types of chest physiotherapy, one of which is chest percussion, Chest Percussion can be performed on infants, children, and adults, especially on clients who have difficulty removing secretions from the lungs. This Chest Percussion action is effective in helping patients reduce thickened secretions in the respiratory tract so that additional breath sounds in patients can be reduced or

can disappear, changes in breathing frequency before and after Chest Percussion action, the client no longer appears to be breathing heavily and additional breath sounds are reduced or disappear. (Maidartati, 2022). Based on previous research, it states that there is an effect of chest physiotherapy on sputum discharge in children with pneumonia at the Depok City Hospital and there is a difference between sputum discharge before and after chest physiotherapy is performed on toddlers with pneumonia. With respondents aged 3-5 years as many as 30 toddlers consisting of 15 respondents in the control group and 15 respondents in the intervention group using statistical tests, namely the Mc Nemar test. After Chest Percussion chest physiotherapy, sputum output increased. Toddlers who did not produce sputum were (26.7%) and sputum that came out was (73.3%) so that a p value of 0.002 was obtained and there was a significant effect on the p value = 0.002 (p value <0.05) (Faisal & Najihah, 2019). This opinion is supported by other studies stating that the majority of respondents had abnormal respiratory rates before chest physiotherapy and the majority had normal respiratory rates after chest physiotherapy (Saruza, 2019 in Subekti et al., 2023).

Based on several studies that have been conducted by previous researchers, researchers are interested in further researching the effectiveness of chest physiotherapy in the form of chest percussion. Chest Percussion is one of the independent nursing actions that is easy for nurses to do because it is effective in reducing the amount of sputum in pediatric patients with pneumonia, with reduced sputum it is expected that additional breath sounds will be reduced. Based on the description above, researchers are interested in knowing "The Effect of Chest Percussion on Reducing Additional Breath Sounds in Pneumonia Patients in the Bougenville room of Rumah Sakit dr. Haryoto Lumajang".

## II. METHOD

Research design is a strategy used in research that is used for designing and identifying problems in data collection and is used to define the structure of the research to be carried out. This type of research is pre-experimental using a one group pretest-posttest approach, because there is an initial test (pre-test) before being given treatment and a final test (posttest) after being given treatment (Nursalam, 2015). In this study, the subjects were first given an initial test (pre-test) to determine the extent of additional breath sounds before being given chest physiotherapy. After the pretest, the child was then given treatment, namely chest percussion. After chest physiotherapy was completed, a final test (posttest) was given to determine the extent of the effect of chest physiotherapy on additional breath sounds in children with pneumonia. Researchers want to know that chest physiotherapy can reduce additional breath sounds in children with pneumonia.

## III. RESULT

### 1) Research Result

#### 1. Overview of Research Location Results

This research was conducted in the Bougenville Room of the Rumah Sakit dr. Haryoto Lumajang located at Jalan Basuki Rahmat No. 5, Tompokersan, Lumajang District, Lumajang Regency, East Java. Rumah Sakit dr. Haryoto Lumajang is a type B government hospital in Lumajang Regency and has been fully accredited. There are several health care facilities available at this hospital, including outpatient services, inpatient services, health tests (general medical check-ups), radiology, pathology laboratories, anatomical pathology laboratories, and other supporting services. The Bougenville Room is one of the inpatient care facilities specifically for children with a capacity of 44 beds divided into the main care room and the standard care room.

**2. General Data**

**a. Respondent Characteristics Based on Age**

**Table 1 Frequency distribution of respondent characteristics based on age in pneumonia patients in the Bougenville Room of RSUD dr. Haryoto Lumajang**

Age	Median (Min-Max)	Mean (Std. Deviasi)
Age	9 (6-12)	8.52 (1.546)

Based on table 1 above shows that the age of respondents ranges from 6 to 12 years. The median of the respondent's age is 9 with an average of 8.52 and a standard deviation of 1.546.

**b. Respondent Characteristics Based on Gender**

**Table 2 Frequency distribution of respondent characteristics based on gender in pneumonia patients in the Bougenville Room of Rumah Sakit dr. Haryoto Lumajang**

Gender	Frequency	%
Male	18	58.1
Female	13	41.9

Based on table 2 above, it shows that male respondents are 18 (58.1%). While female respondents are 13 (41.9%).

**3. Special Data**

**a. Frequency of Additional Breath Sounds Pre-Chest Percussion**

**Table 3 Distribution of frequency of additional breath sound categories before Chest Percussion was performed on pneumonia patients in the Bougenville room of Rumah Sakit dr. Haryoto Lumajang.**

Additional Breath Sounds	Frequency	%
Clear	0	0
Fine rhonchi heard	11	35.5
Ronchi disappear with cough/sniffle	20	64.5
Coarse rhonchi with cough/sniffle	0	0

Based on table 3 above, it shows that the largest value of respondents in this study, namely 20 (64.5%) children with pneumonia experienced rhonchi sounds that disappeared with coughing or sucking.

**b. Frequency of Additional Breath Sounds Post Chest Percussion**

**Table 4 Frequency distribution of additional breath sound categories after Chest Percussion in pneumonia patients in the Bougenville room of Rumah Sakit dr. Haryoto Lumajang**

Additional Breath Sounds	Frequency	%
Clear	11	36.5
Fine rhonchi heard	18	58.1
Ronchi disappear with cough/sniffle	2	6.4
Coarse rhonchi with cough/sniffle	0	0

Table 4 above shows that the majority of respondents after Chest Percussion, namely 18 (58.1%) children with pneumonia, still heard fine rhonchi.

**2) Data Analysis**

**1. Cross Table of Chest Percussion against Additional Breath Sounds**

	<i>Post-Chest Percussion</i>			Total (%)
	<i>Pre-Chest Percussion</i> Clear (%)	Fine rhonchi heard (%)	Ronchi Disappear with Cough/Suction (%)	
Fine rhonchi heard (%)	11 (100)	0	0	11 (35.5)
Ronchi disappear with cough/sniffle (%)	0	18 (90)	2 (10)	20 (64.5)
<b>Total</b>	11 (35.5)	18 (58.1)	2 (6.4)	31 (100)

Based on table 5 above, it shows that of the 20 (64.5%) respondents with rhonchi that disappeared when coughing/sucking before the chest percussion procedure was performed, there were 18 (90%) respondents who heard fine rhonchi after the procedure.

## 2) Effect of Chest Percussion on Additional Breath Sounds

**Table 6 Effect of Chest Percussion on Additional Breath Sounds in Pneumonia Patients in the Bougenville Room of Rumah Sakit dr. Haryoto Lumajang**

Variabel	P
Chest Percussion for Additional Breath Sounds	0.000

Based on table 6 above, it shows that based on the results of the Wilcoxon statistical test, the p-value is 0.000 ( $p < 0.05$ ), which means that the hypothesis in this study is accepted. This means that there is a significant effect of Chest Percussion on reducing additional breath sounds in pneumonia patients.

## IV. DISCUSSION

### 1. Interpretation of Data and Results

#### 1) Additional Breath Sounds Before Chest Percussion in Pneumonia Patients

The results of this study showed that there were 11 (35.5%) children with pneumonia who had additional breath sounds, namely fine rhonchi. Then there were 20 (64.5%) children with pneumonia who had rhonchi sounds that disappeared with coughing/sucking. Before chest percussion, no respondents had coarse rhonchi sounds with coughing/sucking and also clear or no additional rhonchi breath sounds. These results are more or less in line with research conducted by Achirulah et al., (2024) which showed that before chest physiotherapy, 16 (100%) respondents had ineffective airway clearance.

Then research conducted by Sriwidiastuti et al., (2023) showed that of the 5 respondents observed, 5 (100%) had additional rhonchi breath sounds before being given chest physiotherapy. Research conducted by Nur Pratiwi et al., (2023) also showed that 2 respondents who were observed before

being given chest physiotherapy had additional rhonchi breath sounds.

Pneumonia is still a health problem in almost all countries in the world suffered by children and adults (Nur Pratiwi et al., 2023). Symptoms of pneumonia can include rapid breathing and shortness of breath in toddlers due to sudden attacks of lung inflammation (Budihardjo and Suryawan, 2020). In addition, when pneumonia occurs, the alveoli will be filled with fluid and erythrocytes which cause symptoms such as fever, coughing up greenish phlegm, shortness of breath or pulling in the lower chest wall, rapid breathing, and other symptoms such as headaches, restlessness and decreased appetite (Sura Pongsibidang et al., 2022). Pneumonia is a form of acute respiratory infection that attacks lung tissue. The lungs consist of small sacs called alveoli that are filled with air during inspiration and expiration (Dewi et al., 2024). Alveoli filled with fluid can cause additional breath sounds (WHO, 2019). There are several types of additional breath sounds, including rhonchi, wheezing, and gurgling (Andi, Modjo and Ismail., 2023). The results of a physical examination of pneumonia patients, especially on breath sounds, will find vesicular and weakened sounds, wet, fine, and loud rhonchi. So that ineffective airway clearance can occur due to the inflammatory process in the lungs or lung parenchyma (Nur Pratiwi et al., 2023).

Patients with pneumonia will generally have additional breath sounds, namely rhonchi. Ronchi are short, discontinuous sounds of the lungs that burst and are heard in both the inspiration and expiration phases. The sudden burst of previously closed small airways reflects the presence of rhonchi. Ronchi can also occur due to regional airway closure due to mucus accumulation in the airways (Andi, Modjo and Ismail., 2023). The researcher assumes based on the explanation above, that the additional breath sounds of rhonchi in patients with pneumonia in this study are due to the inflammatory process in the lungs or lung parenchyma in patients with pneumonia which causes the alveoli to contain fluid and increases sputum production. So that there will be a buildup of sputum/secretions in the airways which can cause rhonchi sounds.

## 2) Additional Breath Sounds After Chest Percussion in Pneumonia Patients

The results of this study showed that there were 11 (36.5%) children with pneumonia who had clear breath sounds or no additional breath sounds including rhonchi. Then there were 18 (58.1%) respondents who still heard fine rhonchi and 2 (6.4%) respondents who still heard rhonchi that disappeared with coughing/sucking. Furthermore, there were no respondents who fell into the category of coarse rhonchi with coughing/sucking. The results of this study are in line with the study conducted by Sriwidiastuti et al., (2023) which stated that of the 5 respondents in the study, all respondents experienced a decrease in additional breath sounds after chest physiotherapy. The study conducted by Achirulah et al., (2024) also found that after chest physiotherapy, the patient's sputum production and breath sounds became clear. Nur Pratiwi et al., (2023) also obtained research results that there was a decrease in additional breath sounds after 3 days of chest physiotherapy. Chest physiotherapy is a type of non-pharmacological therapy used to reduce airway obstruction and improve gas exchange. Chest physiotherapy is a therapy consisting of postural drainage, chest percussion, and chest vibration where the aim is to remove secretions in the airways, using gravity to drain and release excessive secretions and reduce the accumulation of secretions in unconscious or weak clients (Melati, Nurhaeni, & Chodidjah, 2018).

Chest physiotherapy can be given to infants, children, and adults, especially to clients who have difficulty removing secretions. This chest physiotherapy action is effective in helping patients reduce signs and symptoms of ineffective airway clearance where these signs and symptoms can be seen from the discharge of secretions or thickened secretions in the respiratory tract, changes in breathing frequency before and after chest physiotherapy is given, the client no longer appears to be breathing heavily (Nur Pratiwi et al., 2023). The purpose of chest physiotherapy in children is to help clear tracheobronchial secretions, thereby reducing airway resistance, increasing gas exchange, and making breathing easier.

The researcher assumes based on the explanation of the theory above, that additional breath sounds of rhonchi in this study decreased after Chest Percussion chest physiotherapy was performed because by doing this action, it can evacuate inflammatory exudate and tracheobronchial secretions which may interfere with the clearance of the airway of patients with pneumonia until additional breath sounds appear, namely rhonchi.

## 3) The Effect of Chest Percussion on Additional Breath Sounds in Children with Pneumonia in the Bougenville Room of Rumah Sakit dr. Haryoto Lumajang

The results of this study indicate that based on the results of the Wilcoxon statistical test, the p-value is 0.000 ( $p < 0.05$ ), which means that the hypothesis in this study is accepted. This means that there is a significant effect between Chest Percussion on reducing additional breath sounds in pneumonia patients. The results of this study are more or less in line with the research conducted by Nur Pratiwi et al., (2023) which stated that there were changes in the results of RR, pulse, sputum, SpO<sub>2</sub> and additional breath sounds before and after chest physiotherapy was given on ineffective airway clearance in children with pneumonia.

Pneumonia is an inflammation or inflammation of the lung parenchyma that can be caused by microorganisms including mycobacteria, bacteria, fungi, and viruses (Nur Pratiwi et al., 2023). Patients with pneumonia will generally have additional breath sounds, namely rhonchi, which can occur due to the presence of sputum in the airways (Andi, Modjo and Ismail., 2023). These changes will also have an impact on reducing the amount of oxygen carried by the blood. Inflammation of the bronchi and lungs will also result in increased mucosal production and ciliary movement in the bronchial lumen, resulting in a cough reflex (Suharjono, 2018). The inflammatory process in the lungs or lung parenchyma can cause ineffective airway clearance which is also relevant to additional rhonchi breath sounds (Hidayat, 2021). One of the nursing management that can be done to overcome this is chest physiotherapy. Chest physiotherapy is a type of non-

pharmacological therapy used to reduce airway obstruction and improve gas exchange. Chest physiotherapy consists of postural drainage, chest percussion, and chest vibration (Melati, Nurhaeni, & Chodidjah, 2018). Chest physiotherapy is a collection of techniques or actions for expelling sputum that are carried out either independently or in combination to prevent the accumulation of sputum which causes airway obstruction and other disease complications (Nur Pratiwi et al., 2023). The purpose of chest physiotherapy in children is to help clear tracheobronchial secretions, thereby reducing airway resistance, increasing gas exchange, and making breathing easier. Chest physiotherapy can also evacuate inflammatory exudate and tracheobronchial secretions, remove airway obstructions, reduce airway resistance, increase gas exchange, and reduce the work of breathing (Bauw et al., 2023). Chest physiotherapy with percussion is an action that is carried out by forming a cup in the palm of the hand and lightly tapping it on the chest wall with rhythmic movements above the lung segment where the secretion will be drained. Chest physiotherapy with percussion is a tapping movement performed on the chest wall with the aim of releasing retained secretions. So Chest Percussion is a pat on the chest wall or back with the hand formed like a bowl. Indications for percussion are routine percussion performed on pneumonia patients. Chest Percussion should be performed carefully in cases of rib fractures, subcutaneous emphysema of the neck and chest area, burns, skin infections, pulmonary embolism, untreated tension pneumothorax (Smeltzer & Bare, 2013; Black and Hawks, 2013; Dewi, Irmayani and Hasanuddin, 2017; Syafiati and Nurhayati, 2021).

The purpose of Chest Percussion itself is to release secretions that are stuck or attached to the bronchi. Chest Percussion is mechanical energy in the chest that is transmitted to the pulmonary airways. Chest Percussion in children aims to help clear tracheobronchial secretions, thereby reducing airway resistance, increasing gas exchange, and making breathing easier (Chaves et al., 2019). Chest Percussion is one of the physiotherapy methods that can

be performed on patients with cardiorespiratory disorders, including pneumonia. Chest Percussion is performed with an exercise pattern to clear the airways so that breathing becomes easier and more comfortable (Salsabila and Adelin, 2022).

Researchers assume based on the theory above, that the results in this study show a significant effect between Chest Percussion and additional breath sounds in pneumonia patients. This is because Chest Percussion can release secretions or sputum that are stuck or attached to the bronchi so that the airways become cleaner and the sound of rhonchi breathing improves, with the loss of sputum the additional breath sounds will be reduced.

### 3. Research Limitations

There are several limitations in this study, namely:

#### a. Use of Bronchodilators or Mucolytics

The limitation of the use of bronchodilators or mucolytics is that the respondents who were the subjects of the study were not assessed whether they received pharmacological therapy, either bronchodilators or mucolytics, during the study.

#### b. Based on the number of respondents

This study was conducted in a minimal population so this is likely less representative if used as a generalization.

## 4 Nursing Implications

### 1) Implications for Services

This study provides information that performing Chest Percussion can reduce additional breath sounds including rhonchi. The results of the study can have an impact as a health service institution, RSUD dr. Haryoto Lumajang can be on services and health where these results can be used as a basis for providing non-pharmacological therapy in the form of chest physiotherapy with the type of Chest Percussion which is expected to reduce additional breath sounds (ronchi) especially in pneumonia patients.

### 2) Implications for Education

The results of this study can have an impact on education, especially health education,

where the results of the study can be used as a reference to increase insight and knowledge for students regarding the effectiveness of using chest physiotherapy with Chest Percussion to reduce additional breath sounds including rhonchi in pneumonia patients.

### **3) Implications for Health**

The results of this study identify the effect of Chest Percussion on reducing additional breath sounds including rhonchi in pneumonia patients.

## **V. CONCLUSION**

The conclusions that can be drawn based on the objectives and results of the study on the effect of Chest Percussion on additional breath sounds in pneumonia patients in the Bougenville Room of Rumah Sakit dr. Haryoto Lumajang, are:

1. Additional breath sounds before chest percussion, the results of additional breath sounds were obtained in 11 (35.5%) children with pneumonia who had additional breath sounds of fine rhonchi, 20 (64.5%) children with pneumonia experienced rhonchi sounds that disappeared with coughing/sucking.
2. Additional breath sounds after chest percussion, the results of additional breath sounds were obtained in 11 (36.5%) children with pneumonia whose breath sounds were clear or no rhonchi sounds were heard.
3. The results of the Wilcoxon statistical test obtained a p-value of 0.000 ( $p < 0.05$ ) meaning that there was a significant influence between Chest Percussion on additional breath sounds including rhonchi in pneumonia patients



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