

APPLICATION OF PHYSIOTHERAPY PROCEDURES IN CHILD PATIENTS WITH IN EFFECTIVE AIRWAY CLEAN: LITERATURE REVIEW

Yupi Supartini¹⁾, Ratna Ningsih²⁾, Febriyanti Saputri³⁾

Politeknik Kesehatan Kemenkes Jakarta III ^{1,2,3)}

Keywords

Chest physiotherapy, Ineffective airway clearance, Children

ABSTRACT

Introduction

Ineffective airway clearance is the inability to remove secretions or airway obstruction in order to maintain the airway and maintain a clean airway. If not treated immediately, it can cause serious problems such as shortness of breath, respiratory failure and even death. One of the nursing care provided by nurses is chest physiotherapy, which is a therapeutic action carried out by means of postural drainage, clapping and vibrating to help clear the airway naturally by reducing or preventing airway obstruction from secretions.

Method(s)

This literature review uses the literature review method with 10 research journals as sources of literature. This study discusses in depth the concept of ineffective airway clearance, the effect of chest physiotherapy procedures in an effort to remove secretions.

Result(s)

From 10 journal articles that have been analyzed, physiotherapy has a significant effect on sputum production in children and maintaining airway patency.

Conclusion(s)

Physiotherapy affects sputum production in children with ineffective airway clearance.

INTRODUCTION

Children who have diseases of the respiratory system usually experience excessive mucus production in their lungs. The secretions will build up, making them thicker and harder to come out. Diseases of the respiratory system that are often suffered by children include Acute Respiratory Infections (ARI), pneumonia, asthma and tuberculosis (Siregar and Aryayuni 2019), if not treated immediately can cause very serious problems such as the patient will experience shortness of breath or respiratory failure. even cause death (Praya, 2017). The results of the research conducted (Maidartati 2014) which discussed the effect of chest physiotherapy on children aged 1-5 years who experienced ineffective airway clearance at the

Moch Health Center. Ramdhan Bandung said that chest physiotherapy is very useful for children who suffer from respiratory problems, both acute and chronic. Children who have airway clearance disorders have accumulation of secretions, with this technique it is easier for children to expel secretions. Secretions can be removed from the mouth by the coughing process during chest physiotherapy.

According to WHO in the Ministry of Health (2018), pneumonia accounts for 16% of all deaths under 5 years old, which causes more than 2,500 deaths in children under five per day, or an estimated 2 children die every minute in 2015. In Indonesia, pneumonia is also the second leading cause of death. in infants after diarrhea. Riskesdas (2018) reported that the incidence of pneumonia in the past month

(period prevalence) increased by 4.0% in 2013 to 4.5% in 2018. Riskesdas (2018) reported that the incidence of upper respiratory tract infections (ARI) decreased from the prevalence ARI in 2013 was 25.0% and in 2018 it was 9.3%. Indonesia's 2019 health profile stated that the total number of children suffering from bronchopneumonia in Indonesia reached 52.9%, of which the five provinces that had the highest incidence of bronchopneumonia in children under five were West Papua, 129.1%. DKI Jakarta 104.5%, Banten 72.3%, North Kalimantan 67.9%, Central Sulawesi 67.4%, while the prevalence in South Sulawesi is 18.8% (Kemenkes RI 2018). Often found in infants up to preschool age children who have problems with the inability to expel secretions. One of the nursing care provided by nurses is chest physiotherapy (Oktaviani, & Adi Nugroho 2022).

Chest physiotherapy is a therapeutic action carried out by means of postural drainage, clapping and vibrating to help clear the airway naturally by reducing or preventing airway obstruction from secretions (Dewi, 2018). Research conducted by Dinar Ariasti, et al (2014) with the number of respondents in the study as many as 26 people who suffered from ARI for airway hygiene before chest physiotherapy procedures were carried out. net as many as 3 respondents (11.53%). After doing chest physiotherapy procedures, respondents with a clean airway category were 18 respondents (69.23%), while the number of respondents for an unclean airway category was 8 respondents (30.70%), from the results of this study it can be concluded that physiotherapy procedures The chest has a significant effect on children with ineffective airway clearance because after chest physiotherapy there is an improvement in the condition of the respondent's respiratory status, including better breathing frequency or airway clearance.

Based on the above background, the authors are interested in conducting a literature review entitled "Implementation of chest

physiotherapy procedures in pediatric patients with ineffective airway clearance" in the hope of educating families and the public about chest physiotherapy techniques in children who have problems with ineffective airway clearance.

METHODS

Framework of thinking

This study is a literature review study which means analyzing, criticizing, comparing several previous studies related to the topic of applying chest physiotherapy procedures in children with ineffective airway clearance. The thinking framework used is using the PICO(S) framework formula, the strategy used to search for articles uses the PICO(S) framework, which consists of 5 components, namely: patient population or problems handled (P), interventions provided (I), comparison of the intervention selected for the patient (C), the outcome to be achieved (O), and the study design selected (S).

Search database

The literature review was determined based on the theme regarding the application of chest physiotherapy procedures. The literature search was carried out in February-April 2022. This literature review uses literature published in 2012-2022 which can be accessed in full text in pdf format. The criteria for the journals reviewed are research journal articles in Indonesian and in English. The type of research article journal used was obtained from the results of research that had been carried out by researchers first. Search literature in this literature review using 3 databases, namely GARUDA, Google Scholar, and PUBMED.

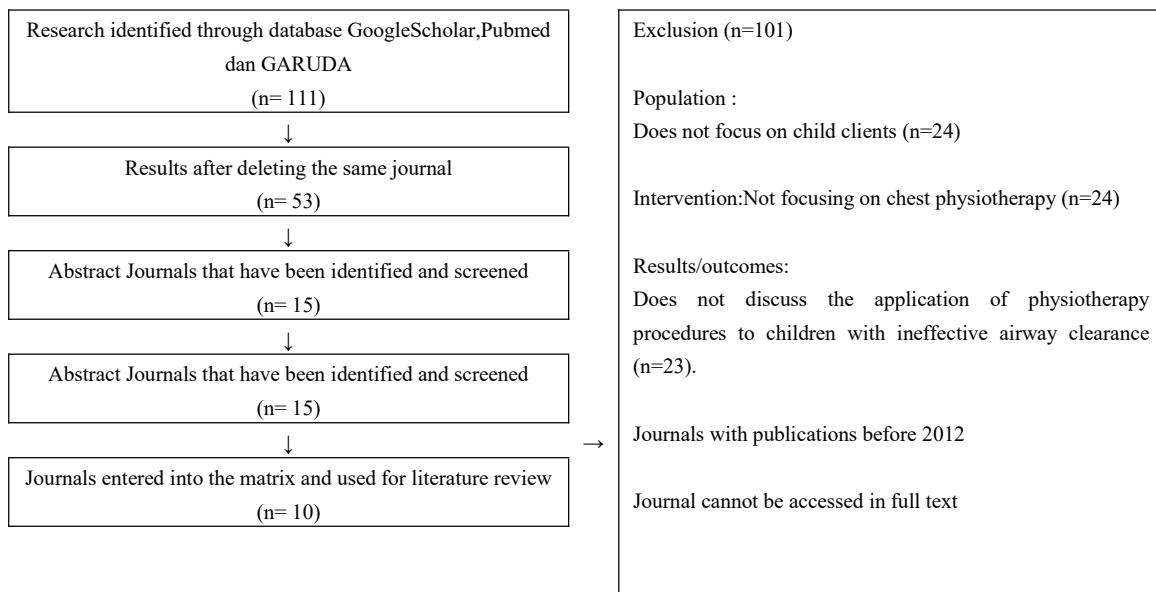
Search keywords

Search articles using keywords that match the research title, these keywords are used to make it easier to find journals for this literature review, the authors use keywords and boolean operators (AND, and OR). The following are the keywords used by the author.

Inclusion and Exclusion Criteria

Table 1 Inclusion and Exclusion Criteria

| Criteria | Inclusion | Exclusion |
|--------------------------|--|--|
| Population | Children with ineffective airway clearance | Apart from children with ineffective airway clearance |
| Intervention | Chest physiotherapy | In addition to chest physiotherapy |
| Comparison | There isn't any | |
| Outcome | Effect of chest physiotherapy on the ability to expel secretions in children with ineffective airway clearance | There is no effect of chest physiotherapy on the ability to expel secretions in children with ineffective airway clearance |
| Study Design | Quasy-experimental, pre-post test | Besides Quasy-experimental, pre-post test |
| Publication Years | 2015-2022 | Before 2015 |
| Language | Indonesian and English | Beside Indonesian and English |



Based on the search results of literature articles through publications in four databases and by using predetermined keywords and using the Mendeley application. Researchers get 111 articles that match these keywords. The search results that have been obtained are then checked to determine whether there are duplicate articles or duplicate articles. If there is, then the articles are excluded and the same 58 articles are obtained, leaving 53 articles. The researcher then screened based on the title (n=40), abstract (n=20), and fulltext (n=12) which was adjusted to the theme regarding the application of chest physiotherapy procedures, from 12 articles that had been identified based on eligibility for inclusion and exclusion criteria, There are 10 articles that can be used in the literature review.

RESULTS

Table 2 General Characteristic in Study Completion (n=10)

| Category | n | % |
|--|-----------|-------------|
| Year of publication | | |
| 2014 | 2 | 20% |
| 2015 | 2 | 20% |
| 2016 | 1 | 10% |
| 2018 | 2 | 20% |
| 2019 | 1 | 10% |
| 2020 | 2 | 20% |
| Total | 10 | 100% |
| Intervention | | |
| Chest physiotherapy | 9 | 90% |
| Chest physiotherapy combined with antibiotic therapy | 1 | 10% |
| Total | 10 | 100% |
| Research design | | |
| Quasi experimental | 4 | 40% |
| Randomized control trial (RCT) | 4 | 40% |
| Prospective blindfold clinical trial | 1 | 10% |
| Pre and post without control | 1 | 10% |
| Total | 10 | 100% |

This literature review uses journals published in 2014-2020, with the intervention used chest physiotherapy and the most widely used

research designs are quasi-experimental and RCT designs.

Table 3 Performing Chest Physiotherapy Procedures

| No | Author and Year of Publishing Journal | Journal Title | Implementation Results and Effects Water Edged Sponge |
|----|--|--|---|
| 1. | Chella Aryayuni, Tatiana siregar (2015) | Pengaruh fisioterapi dada terhadap pengeluaran sputum pada anak dengan penyakit gangguan pernapasan di poli anak RSUD Kota Depok | There is a difference between sputum production before and after the intervention is evidenced by the difference in the mean between the presence and absence of sputum is -0.73 which has a difference between the lower range of -1.04107, a negative sign means that the sputum production before the intervention is smaller than after the intervention. intervention is carried out |
| 2. | Dinar ariasti, Sri aminingsih, Endrawati (2014) | Pengaruh pemberian fisioterapi dada terhadap bersihan jalan napas pada pasien ISPA di Desa Pucung Eromoko Wonogiri | Airway hygiene before chest physiotherapy was given as many as 23 respondents whose airways were not clean (88.47%) and after being given chest physiotherapy as many as 18 (69.23%) children whose airways were clean and 8 (30.70%) children whose airways were clean. His airway is not clear. Physiotherapy is carried out for 20 minutes 3 times a week |
| 3. | Muhammad arif, Muhammad salman bashir, Rabiya Noor | Effectiveness of chest physiotherapy in | Prior to chest physiotherapy, 20 participants whose airways were not clear after 30 minutes of chest physiotherapy for 5 |

| No | Author and Year of Publishing Journal | Journal Title | Implementation Results and Effects Water Edged Sponge |
|----|---|---|---|
| | (2014) | the management of bronchiectasis | consecutive days with a combination of antibiotics, 13 of 20 people had SpO ₂ of 98% and decreased dyspnea. The intervention carried out was chest physiotherapy combined with antibiotic therapy |
| 4. | Marta Roque I figuls, Maria Gine-Gariga, Claudia Grandos Rugeles | Chest physiotherapy for acute bronchiolitis in paediatric patient between 0 and 24 months old | Respondents were subjected to effective chest physiotherapy and coughing techniques coupled with oxygen therapy until oxygen saturation >94%. All interventions were administered twice daily. |
| 5. | Henita chania, Dhona andhini, Jaji jaji (2020) | Pengaruh teknik perkusi dan vibrasi terhadap pengeluaran sputum pada balita dengan ISPA di Puskesmas Indralaya. | It was found that the pretest sputum production in the control group Most of the respondents did not come out and after 10 minutes the pretest was carried out, followed by the posttest, the results were 12 respondents who did not come out. This means that there is no significant effect p value = 0.5 (p value > 0.005) Researchers conducted a chest physiotherapy intervention that could be done 2 times a day and usually done an hour and a half before meals |
| 6. | Gabriela Ss Chaves, Diana A Freitas, Thayla A Santino (2019) | Chest physiotherapy for pneumonia in children | Using 2 interventions, namely conventional chest physiotherapy the second intervention is with modern techniques |
| 7. | Elsayed Said Mehrem, Abdel-Azeem El-Mazary, Mohmed Ibrahim Ahmed Mabrouk (2018) | Study of chest therapy effect on full term neonates with primary pneumonia | Each session is applied for 3-5 minutes, and is carried out for 6 days/week |
| 8. | Lieselotte corten, Jennifer Jelsma dan Brenda M. Morrow | Chest physiotherapy in children with acute bacterial pneumonia | Before the action, the average oxygen saturation was below 95% and the average breathing was above 45x/min. After the intervention, no significant changes were seen between the intervention and control groups (p=0.8). Chest physiotherapy was administered twice daily for an average of 30 minutes per session |
| 9. | Rosa Melati, Nani Nerhaeni, Siti Chodijah (2018) | Dampak fisioterapi dada terhadap status pernapasan anak balita pneumonia di RSUD Koja dan RSUD Pasar Rebo | Pre and post intervention the difference between the mean changes in respiratory status HR and SaO ₂ before and after the intervention had a significant and significant result with a p value of 0.001 |

| No | Author and Year of Publishing Journal | Journal Title | Implementation Results and Effects |
|-----|---------------------------------------|--|---|
| | | Jakarta | |
| 10. | Ribut Tri Puji Khasto, Wahyuningsih | Penerapan fisioterapi dada untuk meningkatkan efektivitas jalan napas dan mengurangi kecemasan pada anak dengan ISPA | After intervention, 3 respondents (75%). Chest physiotherapy is done 30 minutes routine every day |

Based on the matrix above, it can be concluded that the frequency of chest physiotherapy carried out by respondents is 2 to 5 times a week with an average duration of 15-45 minutes. Almost all articles explain that

before and after the intervention the researchers conducted tests aimed at determining the improvement of airway clearance in respondents.

Table 4 Effect of Chest Physiotherapy in Childern with Ineffective Airway Clearing

| No | Author and Year of Publishing Journal | Journal Title | Implementation Results and Effects |
|----|---|--|---|
| 1. | Chella Aryayuni, Tatiana siregar (2015) | Pengaruh fisioterapi dada terhadap pengeluaran sputum pada anak dengan penyakit gangguan pernapasan di poli anak RSUD Kota Depok | The results of the analysis using a paired sample t-test obtained p value 0.000 <a 0.025, which means that there is an effect of chest physiotherapy on sputum production in children with respiratory disorders at the City Hospital Depok |
| 2. | Dinar ariasti, Sri aminingsih, Endrawati (2014) | Pengaruh pemberian fisioterapi dada terhadap bersihan jalan napas pada pasien ISPA di Desa Pucung Eromoko Wonogiri | The results of this study were 26 people because only 26 people suffered from ARI. Airway cleanliness before being given chest physiotherapy, respondents whose airways were not clean (88.47%) were 23 respondents, while those whose airways were clean (11.53%) were 3 respondents and after being given chest physiotherapy to ARI patients, 18 were respondents (69.23%) for the category of airway clean, while as much as 8 respondents (30.70%) for the category of unsanitary npas roads. It can be concluded that there is an effect of giving chest physiotherapy on airway hygiene in ARI patients in Pucung Eromoko Village, Wonogiri. |
| 3. | Muhammad arif, Muhammad salman bashir, Rabiya Noor (2014) | Effectiveness of chest physiotherapy in the management of | The results of the ANOVA and post hoc tests were used to analyze the study. It was observed that the combined effect of antibiotics and chest physiotherapy had a |

| No | Author and Year of Publishing Journal | Journal Title | Implementation Results and Effects Water Edged Sponge |
|----|--|---|--|
| | | bronchiectasis | significant effect in patients with airway clearance problems, reduced recurrences, and increased dyspnea, breath sounds, and reduced phlegm. and increase in SpO ₂ (P-value<0.05) |
| 4. | Marta Roque I figuls, Maria Gine-Gariga, Claudia Grandos Rugeles | Chest physiotherapy for acute bronchiolitis in paediatric patient between 0 and 24 months old | Results from analysis with 12 RCTs (1249 participants). 246 participants received chest physiotherapy (vibration, percussion and postural drainage) and 1003 participants underwent passive flow-oriented expiratory technique. Conventional techniques failed to show any benefit in primary outcome changes in bronchiolitis severity status as measured by clinical scores, however, in patients with mild to moderate bronchiolitis, forced expiration combined with conventional chest physiotherapy techniques resulted in an immediate change in disease severity after surgery. chest physiotherapy |
| 5. | Henita chania, Dhona andhini, Jaji jaji (2020) | Pengaruh teknik perkusi dan vibrasi terhadap pengeluaran sputum pada balita dengan ISPA di Puskesmas Indralaya. | Mc Nemar statistical analysis in both groups found that there was no effect of sputum production between before and after in the control group, p value was 0.5 while in the group intervention obtained a p value of 0.002 which means that there is an influence of percussion and vibration techniques on sputum production in infants with ARI at the Indralaya Health Center. The results of the Chi Square test in both groups showed p value = 0.004 which means that there is a comparison between the control group and the intervention group on sputum production in infants with ARI at the Indralaya Health Center. Based on research, percussion and vibration techniques can be used as a treatment to help and clear the airway from sputum retained on the chest wall in toddlers with ARI. |
| 6. | Gabriela Ss Chaves, Diana A Freitas, Thayla A Santino (2019) | Chest physiotherapy for pneumonia in children | The results of the analysis of three RCTs assessing five studies that considered peripheral oxygen saturation levels only two reported that users of chest physiotherapy (CPAP and conventional chest physiotherapy) showed greater improvement in peripheral oxygen saturation levels however, it is not clear whether respiratory rate improved after chest physiotherapy. |
| 7. | Elsayed Said Mehrem, Abdel-Azeem El-Mazary, | Study of chest therapy effect on full term neonates | There was a significant difference between group I, neonates receiving routine treatment) and group II, neonates receiving |

| No | Author and Year of Publishing Journal | Journal Title | Implementation Results and Effects Water Edged Sponge |
|-----|---|--|--|
| | Mohmed Ibrahim Ahmed Mabrouk (2018) | with primary pneumonia | routine treatment plus chest physical therapy regarding the duration needed for mechanical ventilation and/or oxygen ($p < 0.045$), the duration needed for clinical improvement ($p < 0.042$), duration required for oral feeding ($p < 0.035$) and duration of hospitalization ($p < 0.031$). |
| 8. | Lieselotte corten, Jennifer Jelsma dan Brenda M. Morrow | Chest physiotherapy in children with acute bacterial pneumonia | The results of two randomized controlled trials and one direct study identified no complete trial reporting differences between the control and intervention groups, and one study reported a longer duration of cough ($p=0.04$) and in rhonchi ($p=0.04$). 0.03) in the intervention group |
| 9. | Rosa Melati, Nani Nerhaeni, Siti Chodijah (2018) | Dampak fisioterapi dada terhadap status pernapasan anak balita pneumonia di RSUD Koja dan RSUD Pasar Rebo Jakarta | The results of the research analysis showed that the mean value of SaO ₂ before and after the intervention was given in the second measurement had a significance value (p value <0.05) so it could be concluded that there was a difference in HR between before and after the intervention in the second measurement. Meanwhile, the results of the paired t-test analysis explained that the average HR before and after the second intervention had a significance value of $P = 0.832$, (> 0.05). so it can be concluded that there is no difference in HR values between before and after being given an intervention in the second measurement. |
| 10. | Ribut Tri Puji Khasto, Wahyuningsih | Penerapan fisioterapi dada untuk meningkatkan efektivitas jalan napas dan mengurangi kecemasan pada anak dengan ISPA | Shows that respondents aged less than 5 years were 2 children (50%), and more than 5 years there were 2 children (50%), after effective coughing and chest physiotherapy, 3 children (75%) experienced sputum production. 1 child did not experience sputum production (25%), the results showed that there was an effect of effective cough and chest physiotherapy on sputum production in children who were able to produce sputum, so that chest physiotherapy had an effect on airway clearance and could increase sputum production. |

Based on the matrix above, almost all respondents before chest physiotherapy had complaints as evidenced by the presence of secretions, but after chest physiotherapy intervention, most of the respondents experienced improved airway clearance. Of the 10 journals, there are 2 articles that have

research results that show that there is no effect of chest physiotherapy after the respondent has intervened, although there are 2 articles that have different conclusions from other articles, but 80% of research articles that have been selected show that there is an effect. significant effect of chest physiotherapy procedures in

improving ineffective airway clearance in children.

DISCUSSIONS

Age

Factors that affect sputum production in a person are age, at the age of children and toddlers the cough mechanism is not perfect so active and passive actions are needed to remove sputum and clear the airway in children and toddlers.

The average age of children in the chest physiotherapy group in the journal above is under 12 years with the youngest age being 29 days and the oldest age being 12 years. Babies and toddlers have defense mechanisms that are still weak compared to adults, so toddlers are included in the group prone to influenza and pneumonia infections. Children aged 0-24 months are more susceptible to pneumonia, this is due to immature immunity and relatively narrow respiratory tract, so that infants and toddlers are easily exposed to ineffective airway clearance (Depkes RI, 2015).

Sex

Research conducted by Chella Aryayuni, Tatiana Siregar (2015) respondents who were 6 men and 5 women, research conducted by Henita Chonia and Dhonna Andhini (2020) respondents were 15 men and there are 15 women, research conducted by Elsyahed Said (2018) there are 10 female respondents and 20 male respondents, research conducted by Lieselotte Corten (2015) found that 95 male respondents and female respondents as many as 66 people, meanwhile there are six journals that do not explain in detail the gender of the respondents.

From the discussion above, it can be concluded that children are more likely to experience ineffective airway clearance because of the inability to excrete secretions independently and maintain a clean and patent airway.

Performing Chest Physiotherapy Procedures

Several journals in this literature review mention chest physiotherapy combined with other therapies, both pharmacological and non-pharmacological therapies.

The procedure for implementing chest physiotherapy according to Setiawati (2017) consists of three stages, namely the first stage, namely the preparation stage starting from

preparing the tools needed, the second stage identifying the client consisting of indications and contraindications for chest physiotherapy and assessing the understanding and ability of parents in doing physiotherapy. chest physiotherapy, then make a contract with the patient and parents when they tell you that chest physiotherapy will be done before eating and one and a half hours after eating to avoid vomiting, then instruct the patient to wear a shirt that is not tight and check the segment that will be done chest physiotherapy.

Furthermore, the first stage of implementation is washing hands, explaining to patients and parents about the procedure to be carried out, then doing postural drainage, percussion, and vibration according to the segment that has been determined, doing it on each segment filled with secretions and recommending coughing. effectively and take a deep breath (if possible), then give the opportunity for parents to do it again so that it can be done at home independently, after everything is finished, return the child to its original position and as comfortable as possible, then the documentation stage, evaluate the results of the response to patients and parents, the child's ability to produce sputum and properly documented.

In a study conducted by (Chania, Andhini, and Jaji 2020), researchers provided chest physiotherapy interventions to respondents who experienced ARI by visiting the respondent directly. Prior to chest physiotherapy, the researcher auscultated the sputum site. Percussion and vibration techniques are carried out by tapping the respondent's chest wall and vibrate the hands according to where the sputum is, this action ends with coughing to remove sputum maximally. This activity is carried out three times for ten minutes in the morning.

Effect of Chest Physiotherapy in Children with Ineffective Airway Clearing

Based on the ten journals that have been selected, all journals explain that the effect of chest physiotherapy to overcome airway clearance is not effective, but in the journal entitled "The effect of chest physiotherapy on airway cleanliness in ARI patients in Pucung Ermoko Wonogiri Village" from the results of research that has been done found 8 respondents whose airways are still not clean. This is because there are respondents who are less cooperative and physically unwell so that when given physiotherapy the respondent's

chest feels weak. Another possible cause is that chest physiotherapy was only given twice so that the results were less than optimal, besides that the respondents in performing effective coughing techniques were not controlled because the respondents did not follow the instructions correctly.

Based on the discussion of ten research journals that have been reviewed, almost all journals have something in common, namely the great influence of chest physiotherapy to overcome ineffective airway clearance in children. Judging from this explanation, it can be concluded that chest physiotherapy interventions that are carried out routinely according to a predetermined time are proven to be able to expel phlegm and make the airway clear.

CONCLUSIONS

Based on the discussion of ten research journals that have been reviewed, almost all journals have something in common, namely the great influence of chest physiotherapy to overcome ineffective airway clearance in children.

Chest physiotherapy therapy is used in the treatment of most diseases of the respiratory system in children including chronic respiratory diseases and acute respiratory diseases which are very effective in removing phlegm or sputum and improving ventilation in patients with impaired lung function.

Factors that affect sputum production in a person, namely age, at the age of children and toddlers the cough mechanism is not perfect so that active and passive actions are needed to remove sputum and clear the airway in children and toddlers. The average age of children in the chest physiotherapy group in the journal above is under 12 years with the youngest age being 29 days and the oldest age being 12 years. Babies and toddlers have defense mechanisms that are still weak compared to adults, so toddlers are included in the group prone to influenza and pneumonia infections.

Chest physiotherapy is carried out with postural drainage, vibration, and percussion techniques which are carried out 2 times a day and carried out for no more than 30 minutes. The steps in chest physiotherapy action begin with the preparation stage, namely identifying indications and contraindications for chest physiotherapy, checking segments to determine the location of secretions. The working phase begins with washing hands, explaining the

action to be performed, then positioning the patient for postural drainage to determine segments for 10-15 minutes, percussion for 1-2 minutes and vibration for 4-5 minutes. The documentation phase is to evaluate the client's response and ability to issue secretions, document them appropriately. Chest physiotherapy can also be done independently at home because it does not require medical equipment, chest physiotherapy can also be combined with other exercises that can produce sputum, for example, effective coughing.

REFERENCE

- Chania, Henita, Dhona Andhini, and Jaji. 2020. "Pengaruh Teknik Perkusi Dan Vibrasi Terhadap Pengeluaran Sputum Pada Balita Dengan ISPA Di Puskesmas Indralaya." Seminar Nasional Keperawatan "Pemenuhan Kebutuhan Dasar dalam Perawatan Paliatif pada Era Normal Baru" Tahun 2020: 25–30. <http://www.conference.unsri.ac.id/index.php/SNK/article/view/1727>.
- Dewi, S. 2018. Modul Praktika Keperawatan Anak. Jakarta: Asosiasi Institusi Pendidikan Vokasi Keperawatan Indonesia (AIPViKI).
- Jane Ball, R. B. 2017. Principles of Pediatric Nursing Caring for Children Seventh Edition. hokoben: Pearson Education.
- Kasanah WN, Kristiyawati SP, Supriyadi. 2015. 2015. "Efektifitas Batuk Efektif Dan Fisioterapi Dada Pagi Dan Siang Hari Terhadap Pengeluaran Sputum Pasien Asma Bronkial Di Rs Paru Dr. Ario Wirawan Salatiga." Jurnal Ilmu Keperawatan dan Kebidanan (JIKK) 4: 1–7.
- Kemendes RI. 2018. "Hasil Riset Kesehatan Dasar Tahun 2018." Kementerian Kesehatan RI 53(9): 1689–99.
- Keperawatan Profesional, Jurnal, Vivin Oktaviani, and Setiyo Adi Nugroho. 2022. "Studi Literatur: Pengaruh Fisioterapi Dada Pada Pasien Pneumonia." Jurnal Keperawatan Profesional (JKP) 10.
- Maidartati. 2014. "Pengaruh Fisioterapi Dada Terhadap Bersihan Jalan Nafas Pada Anak Usia 1-5 Tahun Yang Mengalami Gangguan Bersihan Jalan Nafas Di

- Puskesmas Moch. Ramdhan Bandung.”
 Ilmu Keperawatan 2(1): 47–56.
- Melati, Rosa, Nani Nurhaeni, and Siti Chodidjah. 2018. “Dampak Fisioterapi Dada Terhadap Status Pernapasan Anak Balita Pneumonia Di Rsud Koja Dan Rsud Pasar Rebo Jakarta.” *Jurnal Ilmiah Keperawatan Altruistik* 1(1): 40–50.
- Muhammad, Arif, Muhammad Salman Bashir, and Rabiya Noor. 2014. “Effectiveness of Chest Physiotherapy in the Management of Bronchiectasis.” *Annals* 20(July 2014): 205–19.
- PPNI, Tim Pokja SDKI DPP. 2017. *Standar Diagnosa Keperawatan Indonesia*.
- Roqué i Figuls, M et al. 2016. “Chest Physiotherapy for Acute Bronchiolitis in Paediatric Patients between 0 and 24 Months Old (Review) SUMMARY OF FINDINGS FOR THE MAIN COMPARISON.” *The Cochrane Database of Systematic Reviews* (2).
- Setiawati, Santun. 2017. *Keterampilan Khusus Praktik Keperawatan Anak*. Jakarta: Salemba Medika.
- Siregar, Tatiana, and Chella Aryayuni. 2019. “Pengaruh Fisioterapi Dada Terhadap Pengeluaran Sputum Pada Anak Dengan Penyakit Gangguan Pernafasaan Di Poli Anak RSUD Kota Depok.” *Jurnal Keperawatan Widya Gantari Indonesia* 2(2): 34–42.
- Sitorus et al. 2018. “Penerapan Batuk Efektif Dan Fisioterapi Dada Pada TB Paru Yang Mengalami Ketidakefektifan Bersihan Jalan Napas Di RSUD Koja Jakarta Utara.” *Jurnal Kesehatan* 4(November 2014): 37–41.
- Sodikin. 2014. “Pengaruh Pemberian Fisioterapi Dada Terhadap Kebersihan Jalan Napas Pada Pasien ISPA Di Desa Pucung Ermoko Wonogiri.” *UIN Maulana Malik Ibrahim* 39(1): 1–15.
- <http://dx.doi.org/10.1016/j.biochi.2015.03.025>
 %0A<http://dx.doi.org/10.1038/nature10402>
 %0A<http://dx.doi.org/10.1038/nature21059>
 %0A<http://journal.stainkudus.ac.id/index.php/equilibrium/article/view/1268/1127>
 %0A<http://dx.doi.org/10.1038/nrmicro2577>
 %0A<http://>.
- Syarifudin, Akbar. 2020. “Pengaruh Fisioterapi Dada Terhadap Perbaikan Klinis Pada Anak Dengan Pneumonia.”
 2507(February): 1–9.
- Wong, D. L. 2008. *Buku Ajar Keperawatan Pediatrik*. Jakarta: EGC.