American Journal of
Health, Medicine and Nursing Practice
(AJHMN)

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American Journal of Health, Medicine and Nursing Practice
ISSN 2520-4017 (Online)
Vol.10, Issue 1, pp 43 – 49, 2024

www.ajpojournals.org

Effectiveness of Chest Physiotherapy in Broncho Pulmonary Clearance in Respiratory Distress Neonates

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Article history
Submitted 27.01.2024 Revised Version Received 31.01.2024 Accepted 09.02.2024

Abstract

Purpose: Globally, the mortality rate of respiratory distress has been quite high due to unability to maintain oxygenation and overcome abnormal work of breathing. Chest Physical therapy, apart from providing advantageous outcomes to the adults, chest physical therapy is pivotal for newborns too but differs in terms of physiology and anatomy. Various chest physiotherapy techniques including percussions, vibrations, and compressions are quite effective in reducing mortality rate in neonates.Many studies has been conducted worldwidely, but still there has been limited data in Pakistan about the effect of bronchopulmonary clearance in neonatal intensive care unit, so this study was conducted to find the effectiveness of chest physiotherapy in neonatal intensive care unit

Materials and Methods: This was the non-randomized controlled trial study conducted in tertiary care hospital of karachi , Pakistan. Total 40 samples collected through convenient based sampling were included in this study . The inclusion criteria including gestational age more than 37 weeks with atelactasis, mucous plugging, airway compromised, intubated or extubated, hospital admission, and chest complications where as exclusion criteria included cardiopulmonary instability, post surgery, pre term, intra ventricular hemmorage, fits or epilepsy, failure to thrive, and on consistent feed. Bronchopulmonary Clearance techniques such as Percussions , Compressions, and Vibrations along with suctioning and postural drainage were performed routinely twice daily session one in morning and one in evening was performed for total 14 days which means total 28 sessions of chest physiotherapy was implemented and chest xray, sp02, Heart rate, and respiratory rate was measured pre and post the sessions.

Findings: The mean age of the participants were 37.050±5.57, out of which 20(52.5%) were females and 19(47.5%) were males. Result showed that post chest xray after chest physiotherapy was .2500±.49355 and post session spo2 was 2. .075 ± 4.56513. The chest physiotherapy was statistically significant in mucociliary clearance, lung expansion, preventing atelectasis, airway clearance, and other chest complications (0.008).

Implications to Theory, Practice and Policy: Limitations of this study were that small sample size was taken, and data was collected from one tertiary care hospital of Karachi so it doesn't showed generalization. Further studies in terms of large sample size are required for validity and reliability of this research.

Keywords: *Effectiveness, Chest Physiotherapy, Broncho Pulmonary, Clearance, Respiratory Distress, Neonates*

1.0 INTRODUCTION

The global impact of neonate mortality is staggering with a substantial number of neonates lossins their lives each day [1] .In Pakistan, neonatal mortality is unacceptably high, and the trend in reduction is slower compared to little one and infant mortality [2] . Despite significant advancements in medical care, many regions still grapple with challenege in providing adequate healthcare resources leading to heightened vulnerability for new born.

The advances in the technology and research development works wonders for the neonatal intensive care unit by utilizing techniques that not only improve survival rate but also quality of life in the neonates [3] . It is all because of these advances that world has been able to reduced the causes of death related to respiratory distress, pneumonia, measles, neonatal sepsis, pneumothorax, neurodevelopmental disorders, and cardiac diseases[4] .One of the most effective treatment advanced approaches is Chest Physical therapy, apart from providing advantageous outcomes to the adults, chest physical therapy is pivotal for newborns too but differs in terms of physiology and anatomy [4,5] . A newborn has a high larynx enabling the epiglottis to guide the larynx up behind the soft palate to produce a direct airway from the nasal cavity to the lungs. This causes neonates to be obligatory nose breathers. They are able also to simultaneously breathe and swallow until two to three months of age [6] .

The ribs of the newborn are positioned horizontally and the intercostal muscles are weak, resulting in a predominantly abdominal· or diaphragmatic pattern of breathing [7]. The lungs of a neonate are less compliant than those of an adult, however, the thoracic wall is more compliant due to the cartilaginous nature of the ribs and lack of intercostal muscle strength.. This difference can lead to an increase in both airways resistance and obstruction [8]. The narrow diameter of the infant's airway and a weak or absent cough reflex can also lead to airways obstructions As newborns are more prone to chest infections, chest physical therapy ranging from positioning to support in aiding extubating ventilator, each technique has its own effect and has been effective in mucociliary clearance, pulmonary hygiene , lung expanding, preventing atelectasis , and many more [9,10].

Various studies has been conducted worldwidely[1,2,3,4], but still there has been limited data in Pakistan about the effect of bronchopulmonary clearance in neonatal intensive care unit, so this study was conducted to find the effectiveness of bronchopulmonary clearance in intensive care unit.

2.0 MATERIALS AND METHODS

This was the non-randomized controlled trial study conducted in tertiary care hospital of karachi , Pakistan. Total 40 samples were incuded through convenience based sampling in this study based on the inclusion and exclusion criteria. The inclusion criteria including gestational age more than 37 weeks with atelactasis, mucous plugging, airway compromised, intubated or extubated, hospital admission, and chest complications where as exclusion criteria included cardiopulmonary instability, post surgery, pre term, intra ventricular hemmorage, fits or epilepsy, failure to thrive, and on consistent feed [11].

Informed Consent form was signed by the parents of the neonates and permission was taken from te incharge of neonatal intensive care unit. Informed consent form consisted of every detail about the benefits, purpose, and duration of the study and that they can withdraw anytime from this study.

Chest Physiotherapy

Firsty, ensured that neonates are not exposed to harmful organism by taking all infective control measures. Alcohal hand rub and iodine scrub was used superior to plain hand wash. Physiotherapist covered the face with mask and two gloves over the hand. Hairs were covered by the cap and gown was worn throughout the procedure [12].

Percussions

Percussions were performed inside the incubator and by placing three fingers "Tenting'' technique'' over the chest and in a steady beat gently avoiding forceful clapping as per the respiratory rate and hemodynamically stability to dislodge the mucous [13].

Compressions and Vibrations

After percussions, compressions were performed in couple with vibrations in the end of inspiratory to throughout the expiration. Compressions and vibratrations were performed over intercostal spaces , compressions are compressive forces where as vibrations are oscillatory forces targetted to provide lung expansion [14].

Suctioning and Postural Drainage

Postural drainage position was performed as per the requirment according to the chest xray with placing effecting side up and good side downward to overcome collapsing of diaphragm. Percussion, compression and vibrations was done in the postural drainage position to use gravity in removing secretions [15,16].

After this suctioning was performed to clear the secretions using 5-6 french suction catheter , in the ventilated neonates manual hyperinflation technique was used to maintain the oxygenation. When performing suction, assistance of staff was taken to prevent from emergency situation [17].

Outcome Measures

Total ten days session were given to the neonates under the supervision of intensivist and drugs prescribed by the pharmacist. Chest Xray findings, SPO2, and Heart rate was measure before and after chest physiotherapy session.

Data was analyzed using SPSS 22.0 version.

3.0 FINDINGS

The mean age of the participants were 37.050±5.57, out of which 20(52.5%) were females and 19(47.5%) were males. Characteristics and demographic details are mentioned in the Table 1.

Table 1: Descriptive Statistics

Variable	Frequency Percentage /Mean Standard Deviation
Gender	
Male	19(47.5%)
Female	21(52.5%)
Age	37.050±5.5
Birth History	
LSCS	31(77%)
SVD	8(20%)

To evaluate the Pre and post effect of chest xray, paired sample t test was applied to measure how much improvement there was in lung expansion. Result showed that chest physiotherapy was effective in improving lung expansion with mean .2500±.49355 and pvalue (0.008) showing statistical significance.

Table 2: Paired Sample Statistics of Pre and Post Chest Xray

Variable	Mean and Standard deviation
Pre and post chest x-ray	.2500±.49355

Pre and post SPO2 was measure after each chest physiotherapy session using paired sample t test, result showed that chest physiotherapy was effective in improving spo2 in neonates with p value (0.007). Results are described in Table 3.

Table 3: Paired Sample Statistics of Pre and Post SP02

Variable	Mean and standard deviation
Pre and Post SP02	2.075 ± 4.56513

Pre and post Respiratory rate was also measure to evaluate chances of tachypnea post chest physiotherapy session and paired sample t test was applied, which showed that chest physiotherapy was highly effective in maintaining respiratory rate of neonates preventing from hemodynamically instability with p value (0.01).

Table 4: Paired Sample Statistics of Pre and Post Respiratory Rate

Variable	Mean and standard deviation
Pre and post respiratory rate	3.025 ± 7.098

4.0 CONCLUSION AND RECOMMENDATIONS

Result showed that chest physiotherapy was effective in mucociliary clearance, lung expansion, preventing atelectasis, airway clearance, and other chest complications.

Limitations of this study were that small sample size was taken, and data was collected from one tertiary care hospital of Karachi so it doesn't showed generalization. Further studies in terms of large sample size are required for validity and reliability of this research.

This research can help physiotherapist in using emerging approaches over traditional approaches in neonatal intensive care unit.

As the results demonstrates positive outcomes, incorporating chest physiotherapy into neonatal care protocols could enhance respiratory function, potentially reducing complications like respiratory distress syndrome and pneumonia leading to less death rate.

REFERENCES

Abdelazeim FH, Zaki OA, Ali HM. Effect of Lung Squeezing Technique on Vital Signs and X-Ray Findings in Neonates with Respiratory Distress Syndrome.

Adıgüzel H, Eğilmez M, Sarıkabadayı Ü, Elbasan B, Demirgüç A, Ergün N. Chest physiotherapy in a neonatal infant after congenital diaphragmatic hernia surgery.

Al-Hashmi S, Al-Mukhaini K, Shaikh S, ElKhamisy A, Al Tahir N, Al Maskari N. Severe Pneumonitis in Omani Infants During An In-Hospital Measles Outbreak: A report of three cases. Sultan Qaboos University Medical Journal. 2022 Feb;22(1):129.

Balasooriya BP, Seneviratne SM. Knowledge And Practices Regarding Open-System Endotracheal Suctioning Among Intensive Care Unit Nurses At The National Hospital Of Sri Lanka.

Chakkarapani AA, Adappa R, Ali SK, Gupta S, Soni NB, Chicoine L, Hummler HD. "Current concepts of mechanical ventilation in neonates"–Part 1: Basics. International Journal of Pediatrics and Adolescent Medicine. 2020 Mar 1;7(1):15-20.

Coleman C, Tambay Perez A, Selewski DT, Steflik HJ. Neonatal acute kidney injury. Frontiers in Pediatrics. 2022 Apr 7;10:389.

Combs H, Shark T, Heiss J, Raessi M, Tavana H. A Quantitative Study of Transport of Surfactant Boli in a Three-Dimensional Lung Model of Neonates. Journal of Biomechanical Engineering. 2023 Feb 1;145(2):021006.

Hamed AE, Mohamed RS. The effectiveness of chest physiotherapy on mechanically ventilated neonates with respiratory distress syndrome: a randomized control trial. Journal of Medicine in Scientific Research. 2022 Apr 1;5(2):129.

Hamed AE, Mohamed RS. The effectiveness of chest physiotherapy on mechanically ventilated neonates with respiratory distress syndrome: a randomized control trial. Journal of Medicine in Scientific Research. 2022 Apr 1;5(2):129.

Hegazy M, Abusaad F. Nurses, knowledge and practices about the care of neonates on mechanical ventilators with respiratory distress. International Journal of Novel Research in Healthcare and Nursing. 2019;6(1):223-31.

Khan S, Haider SI, Bakhsh R. Socio-economic and cultural determinants of maternal and neonatal mortality in Pakistan. Global Regional Review. 2020;1:1-7.

Kotecha MM, Desai M. Current Physiotherapy Practices in Neonatal Intensive Care Unit.

Mcalinden B, Kuys S, Jauncey-Cooke J, Schibler A, Hough J. O002/# 402: THE EFFECTS OF CHEST PHYSIOTHERAPY ON REGIONAL LUNG VOLUME CHANGES IN VENTILATED CHILDREN USING ELECTRICAL IMPEDANCE TOMOGRAPHY. Pediatric Critical Care Medicine. 2021 Mar 1;22(Supplement 1 3S):1.

Mishra R, Dasgupta A, Samuel AJ. Effect of prolonged slow expiratory technique as an adjunct to pulmonary rehabilitation in resolving pulmonary congestion in neonates with congenital pneumonia. Journal of clinical neonatology. 2020 Jan 1;9(1):82.

Orsido TT, Asseffa NA, Berheto TM. Predictors of Neonatal mortality in Neonatal intensive care unit at referral Hospital in Southern Ethiopia: a retrospective cohort study. BMC pregnancy and childbirth. 2019 Dec;19:1-9.

Peng, Z., Guo, X. Z., Xu, Y., Liu, D. H., Wang, H. Y., Guo, L. P., & Zhang, Y. (2020). Advances in interaction between medicinal plants and rhizosphere microorganisms. *Zhongguo Zhong yao za zhi= Zhongguo Zhongyao Zazhi= China Journal of Chinese Materia Medica*, *45*(9), 2023-2030.

Shkurka E, Wray J, Peters M, Shannon H. Chest physiotherapy for mechanically ventilated children: a systematic review. Journal of Pediatric Intensive Care. 2021 Aug 17.

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