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# Study of Chest Physical Therapy Effect on Full Term Neonates with Primary Pneumonia: A Clinical Trial Study

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## *Abstract*

### *Background*
Chest physiotherapy has been used to clear secretions in pediatrics for many respiratory problems. The aim of this study was to investigate the effect of chest physical therapy on full term neonates with primary pneumonia.

### *Materials and Methods*
Sixty full term neonates admitted to neonatal intensive care unit (NICU), Minia University, Egypt, during the period from September 2016 to September, 2017 divided into two equal groups: group I included 30 patients received routine medical treatment according to American Academy of Pediatrics (AAP) recommendations and group II included another 30 patients received routine medical treatment plus chest physical therapy modalities in the form of positioning, postural drainage, percussion and vibration. We compared between the two groups as regards the duration for mechanical ventilation and/or oxygen therapy, clinical improvement, oral feeding and duration of hospitalization.

### *Results*
There was significant differences between group I, neonates who received routine medical treatment) and group II, neonates who received routine medical treatment plus chest physical therapy regarding the duration needed for mechanical ventilation and/or oxygen ($p<0.045$), the duration needed for clinical improvement ($p<0.042$), the duration needed for oral feeding ($p<0. 035$) and the duration of hospitalization ($p<0. 031$).

### *Conclusion*
According the results, chest physical therapy has a positive supportive effect on full term neonates with primary pneumonia regarding the duration needed for mechanical ventilation and/or oxygen therapy, the duration needed for clinical improvement and the duration of hospitalization.

***Key Words:*** Chest, Neonates, Physical Therapy, Pneumonia.

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## 1- INTRODUCTION

Pneumonia is an important cause of neonatal morbidity and mortality in developing countries. It is a main cause of death in 6-9% of all stillborn or newborn infants (1, 2). Forty percent of pneumonia during childhood requires hospitalization (3). Prematurity, premature rupture of membranes and maternal urinary tract infections are known risk factors for developing neonatal pneumonia (4). Between 750,000 and 1.2 million neonates passing every year where pneumonia is included and neonatal pneumonia represents 10% of worldwide childhood mortality (5). Pneumonia mortality chance is emphatically subject to birth weight and onset of the disease. Case casualty rates are substantially higher for intrauterine or early onset pneumonia than for late onset neonatal pneumonia and higher among low birth weight neonates (6). Pneumonias that are gained during childbirth regularly are caused by group II Streptococcus.

Pneumonias procured after birth in the nursery or at home incorporate those caused by respiratory infections (adenovirus, respiratory syncytial infection) gram-positive microbes (group I, B, and G streptococci or Staphylococcus aureus), and gram-negative enteric microscopic organisms most strikingly Escherichia coli and Klebsiella species (2, 7). Neonatal pneumonia signs include tachypnea (respiratory rate > 60/min) snorting, flaring, withdrawals and cyanosis. In term newborn children, pneumonia all the more usually causes hyperinflation with expanded focal peribronchial penetrates and scattered subsegmental atelectasis (8).

Neonatal pneumonia can be dealt with restoratively by wide range strong antibiotics, care and chest physiotherapy once the newborn child is steady clinically (7). Exercise based recuperation modalities such as chest physiotherapy has been utilized to clear emissions; anticipate amassing of flotsam and jetsam and enhance assembly or aviation routes discharges and help lung ventilation in infants for many respiratory issues. Nonintrusive treatment modalities incorporate situating, postural waste, percussion, vibration and suction (8-10). The aim of this study was to study the effect of chest physical therapy on full term neonates with pneumonia regarding the duration needed for mechanical ventilation and/or oxygen, the duration needed for clinical improvement, the duration needed for oral feeding and the duration of hospitalization.

## 2- MATERIALS AND METHODS

### 2-1. Method

This study is prospective blindfold clinical trial (TCTR20180424003) comparing between two groups of patients; the first one (group I) included 30 neonates suffering from primary pneumonia who received routine treatment and another group (group II) included another thirty full term neonates received the same routine treatment plus chest physical therapy during the period from February 2016 to May 2017. The ages of all neonates ranged from one to six days after birth and were diagnosed according to the American Academy of Pediatrics (AAP) clinically (11), radiologically and with adjunct laboratory tests from neonatal intensive care unit (NICU), Minia University hospital, Minia city, Egypt. They were randomly divided equally into two groups; group I: included 30 neonates who received the routine medical treatment according to the American Academy of Pediatrics (AAP) (12) by neonatologists and group II: included another 30 neonates received the routine medical treatment as in group I in addition to chest physical therapy sessions. All neonates with primary pneumonia were selected randomly one for (group I, n= 30 neonates) and another one for (group II,

n=30 neonates). These chest physical sessions applied for group II included positions which were applied for 3-5 minutes for each segment with postural drainage, vibration and percussion (13, 14). The sessions were applied once daily for 6 days/week, each session was about 30 minutes, according to the neonate tolerance till complete clinical cure and discharge from NICU. Neonates of the study group (group II) received a specially designed chest physiotherapy program daily by a specialist in chest physical therapy as following:

### 2-2. Postural drainage

In postural drainage, the patient was positioned in, so the gravity had the greatest effect on the lung segment that has to be drained. Positional projects for babies accentuate all lung zones. The upper projections and right center flap are normal locales of aviation route fall and atelectasis in them and the correct center projection bronchus is encompassed by a neckline of lymph hubs, making it defenseless against extraneous pressure.

### 2-3. Chest percussion

Chest percussion is refined by the utilization of rising three fingers, four fingers, or utilizing any of the financially accessible percussion gadgets made for neonates. A little anesthesia veil or "palm glass" was utilized successfully.

### 2-4. Vibration

It takes after percussion through manual vibratory movement of the advisor's fingers on the baby's chest divider vibrator. Physically by putting the fingers of one hand on the chest divider over the section being depleted with isometric getting the muscles of the lower arm and hand to cause a delicate vibratory movement and other hand bolster the child's head. All evaluation procedures were conducted while being incubated and controlled medically by neonatologist. Informed consents were obtained from parents of all neonates before inclusion in the study, for which local research committee of pediatric department, Minia university approval was obtained. We excluded from the study all preterm neonates less than 37 weeks; post term neonates after 42 weeks, all neonates with respiratory distress other than primary pneumonia like respiratory distress syndrome (RDS), meconium aspiration, congenital heart disease and hypoxic ischemic encephalopathy and infants of diabetic, pre-eclamptic or hypertensive mothers.

### 2-5. Statistical analysis

Results of this study were expressed as mean ± standard deviation (SD) or percentage. Comparison between clinical and laboratory parameters of different groups were done by *t*-test and ANOVA test. Significant difference was considered when P-value <0.05.

## 3- RESULTS

This study included sixty full term neonates divided in two equal groups with no significant differences as regards the demographic data. There were nonsignificant difference between both groups as regards the gestational age ($p>0.23$), birth weight ($p> 0.11$), post-natal age ($p> 0.13$), Maternal age ($p>0.16$) and Apgar score ($p< 0.74$) (**Table.1**). The two groups were comparable in the duration needed for mechanical ventilation or oxygen, as shown in **Table.2**, unpaired t-test revealed that there was a significant difference in between groups (I) and (II) where t- value equals (2.09) which has associated probability value equal ($p= 0.04$); the duration needed for clinical improvement, as shown in **Table.2**, unpaired t- test revealed that there was a significant difference between groups (I) and (II) where t- value equals (2.15) which has associated probability value equal ($p=0.03$); the duration needed for oral feeding, as shown in **Table.2**, unpaired

ttest revealed that there was a significant difference in between groups (I) and (II) where t- value equals (2.23) which has associated probability value equal (p=0.03), and the duration of hospitalization as shown in **Table.2**, unpaired t- test revealed that there was a significant difference in between groups (I) and (II) where t- value equals (2.26) which has associated probability value equal (p=0.03).

**Table-1:** Demographic data that may have an effect on the study

| Variables | | Mean ± SD | t-value | P-value | |
|---|---|---|---|---|---|
| GA | Group I | 39.47 (1.59) | 1.18 | 0.23 | NS |
| | Group II | 38.90 (2.07) | | | |
| BW | Group I | 2.587 (0.232) | 1.60 | 0.11 | NS |
| | Group II | 2.493 (0.220) | | | |
| Post NA | Group I | 3.90 (1.84) | 1.51 | 0.13 | NS |
| | Group II | 3.20 (1.73) | | | |
| Maternal age | Group I | 23.77 (3.64) | 1.39 | 0.16 | NS |
| | Group II | 25.11 (3.76) | | | |
| Apgar score | Group I | 9.03 (0.76) | 0.32 | 0.74 | NS |
| | Group II | 9.10 (0.80) | | | |

SD: standard deviation, P: probability, NS: non-significant; GA: gestational age; BW: birth weight; Post NA: post-natal age.

**Table-2:** The comparison between studied groups as regards the durations needed for mechanical ventilation and/or oxygen therapy, clinical improvement of pneumonia, oral feeding and hospitalization in days

| Duration needed for oxygen support | Group (I) | Group (II) |
|---|---|---|
| Mean ±SD | 7.53 ±3.38 | 5.4 ±2.03 |
| Mean difference | 2.31 | |
| t-value | 2.09 | |
| P-value | 0.04 | |
| Duration for clinical improvement of pneumonia | Group (I) | Group (II) |
| Mean ±SD | 9.64 ±3.5 | 7.07 ±2.46 |
| Mean difference | 2.57 | |
| t-value | 2.15 | |
| P-value | 0.03 | |
| Duration for oral feeding | Group (I) | Group (II) |
| Mean ±SD | 15 ±7.03 | 9.79 ±4.63 |
| Mean difference | 5.21 | |
| t-value | 2.23 | |
| P-value | 0.03 | |
| Duration of hospitalization in days | Group (I) | Group (II) |
| Mean ±SD | 16.33 ±7.1 | 11.4 ±4.55 |
| Mean difference | 4.93 | |
| t-value | 2.26 | |
| P-value | 0.03 | |

*SD: standard deviation; Group (I): Neonates who received routine treatment only; Group (II): Neonates who received routine treatment and chest physical therapy.

## 4- DISCUSSION

Chest physiotherapy has been used to clear secretions, prevent accumulation of debris, improve mobilization of airways secretions and help lung ventilation in newborn with respiratory problems and this improves the efficiency and delivery of oxygenation (11). This study was carried out on 60 neonates; they were divided into two equal groups, 30 patients as a control group received the routine medical treatment and another 30 patients as a study group received routine medical treatment plus chest physical therapy (CPT) sessions. In this study, there was a non- significant difference between both groups regarding the gestational age, birth weight, post-natal age, maternal age and Apgar score. This non-significant difference supported that all these factors had no impact on the results of this study.

Regarding the duration needed for mechanical ventilation or oxygen support in our study, the results showed statistical significant differences between the two groups (p=0.04). Also, the timing for clinical improvement in our study, there was statistical significant difference between them (p=0.04). These results come in concurrence with those reported by Lacey (2008) who ascribed these outcomes to change of oxygenation, change in aviation route protection and expanding the crumbled or atelectasis of the lung in patients who got chest physiotherapy (15).

Scaparrotta et al. (2014) had demonstrated that the more extensive part that physiotherapy may play, ought to be considered as far as situating to enhance ventilation and perfusion, once the consolidator stage starts to determine, chest physical therapy (CPT) systems may have some advantage in preparing and clearing emissions (16). Regarding the duration needed for oral feeding in our study, the results showed statistical significant differences between GB and GA (p= 0.03). Other restorative intercessions utilized as a part of neonates (e.g. drawn out intubation, persistent positive aviation route weight, nasal cannula, customary oropharyngeal, nasal or tracheal suction) may compound negative reactions by the newborn child to oral bolstering trials (17, 18). Notwithstanding the therapeutic symptoms, non-oral bolstering techniques lessen tangible contribution to the mouth, which may bring about deferred oral engine advancement. Non-oral encouraging techniques neither advance nor maintain proper oral engine conduct in the neonate (19). Our results showed a statistical significant correlation between both GB and GA regarding the clinical improvement, duration needed for mechanical ventilation or oxygen support and duration needed for oral feeding which reflected on the duration of hospitalization. The results of this study showed statistical significant difference in the duration of hospitalization between both groups (p= 0.03) and these are in agreement with other reports (18, 20). In this study we excluded preterm infants to avoid possible risks of intracranial complications as reported by many studies (21-23). The small sized sample and lack of long term effects of chest physiotherapy on those neonates were limitations for this study.

## 5- CONCLUSION

According the results, chest physiotherapy program had a positive adjuvant effect and minimize the complications of primary pneumonia in full term neonates by reducing the time needed for mechanical ventilation and/or oxygen support, improving the clinical signs of it as well as the time needed to start oral feeding and the duration of hospitalization for neonates with primary pneumonia.

**6- CONFLICT OF INTEREST:** None.

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