

## Original Research Article

# Study on therapeutic effectiveness of continuous positive airway pressure compared to mechanical ventilation in preterm babies with respiratory distress

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### ABSTRACT

**Background:** Previously mechanical ventilation was primary modality of treatment in preterm neonates with respiratory distress. With the introduction of continuous positive airway pressure (CPAP), the need of mechanical ventilation is reduced. The present study was done to know the therapeutic effects of CPAP as compared to mechanical ventilation in preterm neonates with respiratory distress. To study the duration of oxygen requirement and duration of hospitalisation in preterm neonates treated with CPAP compared to invasive mechanical ventilation

**Methods:** Hospital based prospective study was conducted from November 2013 to November 2014 in Dr. B. R. Ambedkar medical college, Bangalore. All the preterm babies admitted in neonatal intensive care unit with respiratory distress requiring CPAP or mechanical ventilation during study period were included. Total 50 cases were included, out of which 20 (40%) were on CPAP treatment and 30 (60%) were on mechanical ventilation. Outcome was assessed by reduction of respiratory distress with SpO<sub>2</sub> more than 88% with FiO<sub>2</sub> of 21%.

**Results:** Out of 50 preterm neonates studied, 20 (40%) were on CPAP treatment and 30 (60%) were on mechanical ventilation. Mean duration of oxygen treatment was less in neonates on CPAP (4.8±0.9 days) compared to mechanical ventilated neonates (7.12±0.8days) and it is statistically significant (p value<0.05). Mean duration of hospitalisation was less in neonates on CPAP (19.3±0.76 days) compared to mechanical ventilated neonates (21±1.2 days) but it was statistically not significant (P value >0.05).

**Conclusions:** CPAP as a mode of treatment for preterm babies with respiratory distress reduces the duration of oxygen dependency compared to invasive mechanical ventilation. Difference in duration of hospital stay was statistically not significant in these neonates treated with CPAP and mechanical ventilation.

**Keywords:** CPAP, Hospitalisation, Mechanical ventilation, Oxygen dependency, Preterm babies, Respiratory distress

### INTRODUCTION

Respiratory distress is a major complication in preterm neonates due to various causes like respiratory distress syndrome, congenital pneumonia etc.<sup>1</sup> Modes of ventilation in preterm neonates with respiratory distress are noninvasive and invasive ventilation. Previously

mechanical ventilation was primary modality of treatment in preterm with respiratory distress. With the introduction of CPAP (continuous positive airway pressure), the need of mechanical ventilation is reduced.

Invasive mechanical ventilation was associated with increased incidence of barotrauma and volutrauma. Early

use of CPAP reduces chances of barotraumas and volutrauma. CPAP is type of noninvasive ventilation which acts as a link between oxygen treatment and mechanical ventilation. When the babies could not be maintained on CPAP, then invasive mechanical ventilation is done.<sup>1,2</sup> CPAP is being used as primary modality of treatment in preterm neonates with respiratory distress. The present study is done to know the therapeutic effects of CPAP as compared to mechanical ventilation in preterm neonates with respiratory distress.

## METHODS

A hospital based prospective study was conducted in Dr. B. R. Ambedkar medical college from November 2013 to November 2014. All the preterm babies (less than 37 completed weeks of gestation) admitted in neonatal intensive care unit with respiratory distress requiring CPAP or mechanical ventilation during study period were included in study. The study was approved by ethical committee of the institution.

Continuous positive airway pressure was delivered by Fanem Babylog CPAP machine through nasal prongs. CPAP was delivered at 4 cm of water pressure and increased upto 8-9 cm of water pressure. Invasive mechanical ventilation was done by SLE2000 ventilator with appropriate size endotracheal tubes. Babies were admitted in NICU with servo-controlled warmers. Monitoring was done with multipara monitors. Preterm babies were monitored for complications such as desaturation, pneumothorax etc. Monitoring is done by trained personnel and monitored for following components:

- Increase respiratory rate
- Increased work of breathing
- oxygen desaturation
- Cyanosis

### Sample size

Total 50 preterm babies with respiratory distress were included in the study, out of which 20 (40%) were on CPAP treatment and 30 (60%) were on mechanical ventilation.

### Cohorts for comparison

Preterm neonates admitted with respiratory distress on CPAP from November 2013 to November 2014. Preterm neonates with respiratory distress on mechanical ventilation from November 2013 to November 2014.

### Inclusion criteria

- All the preterm babies (less than 37 completed weeks of gestation) admitted in neonatal intensive

care unit with respiratory distress requiring CPAP or mechanical ventilation are included in study.

- Respiratory distress with oxygen saturation less than 88% on oxygen.

### Intubation criteria

- SpO<sub>2</sub> less than 88% with FiO<sub>2</sub> more than 60%
- ABG: pH less than 7.2 and pCO<sub>2</sub> more than 60%

### Exclusion criteria

- Neonates with major congenital anomalies
- Parents not giving consent for ventilation
- Cases discharging against medical advice
- Preterm neonates with impending respiratory arrest
- Preterm neonates who lost follow up.

### Outcome

Improvement is assessed by reduction of respiratory distress with SpO<sub>2</sub> more than 88% with FiO<sub>2</sub> of 21%.

Statistical analysis was done by using SPSS 17. Chi square test and student t-test was used in study. P value less than 0.05 was considered significant.

## RESULTS

Total 50 preterm babies (less than 37 completed weeks of gestation) were included in the study. 22 (44%) babies were male and 28 (66%) were female. 32 (64%) were between 36-37 weeks of gestation, 16 (32%) were between 35-36 weeks of gestation and 2 (4%) were between 34-35 weeks of gestation. Out of 50 neonates, 20 (40%) were treated by CPAP and 30 (60%) were treated by mechanical ventilation (Table 1).

**Table 1: Baseline characteristics of neonates.**

	Primarily treated by CPAP	Primarily treated by mechanical ventilation
Total number of neonates (50)	20 (40%)	30 (60%)
Male:female ratio	13:7 (male 65%)	20:10 (male 66.3%)
Average gestational age (in weeks) on admission	35.6 ±0.6	34.9±0.48

Mean duration of oxygenation was less in neonates treated by CPAP (4.8±0.9 days) compared to mechanical ventilated babies (7.12±0.8 days) (P value <0.05). The duration of hospitalisation was less in neonates treated by CPAP (19.3±0.76 days) compared to mechanical

ventilated neonates ( $21 \pm 1.2$  days). However, duration of hospitalisation is statistically not significant (P value  $>0.05$ ) (Table 2).

**Table 2: Comparison between neonates treated with primarily CPAP and neonates primarily ventilated.**

	Primarily treated by CPAP	Primarily treated by mechanical ventilation	P value
Duration of oxygenation	$4.8 \pm 0.9$ days	$7.12 \pm 0.8$ days	$<0.05$
Duration of hospitalisation	$19.3 \pm 0.76$ days	$21 \pm 1.2$ days	$>0.05$

## DISCUSSION

In preterm babies, respiratory distress has been a major cause of morbidity. Previously mechanical ventilation was used to treat respiratory distress in preterm neonates. But it causes prolonged oxygenation and prolonged hospitalisation.<sup>2</sup> Introduction of noninvasive ventilation like CPAP reduced the morbidity by reducing the duration of oxygenation and hospital stay.<sup>3</sup>

Transwell AR et al, and Chernick V et al, had shown that oxygen requirement reduced in early CPAP treated group and reduced requirement of continuous distending pressure.<sup>4,5</sup> Paolin RA et al, D Paoli AG et al, had shown reduced incidence of morbidity in terms of chronic lung disease and requirement of intubation in CPAP treated group.<sup>6,7</sup> Heygi T et al, Mao G et al, Miller MJ et al, had shown that early CPAP reduced the rate of disease worsening in respiratory distress.<sup>8-10</sup> E Bancalari et al, had shown that CPAP reduces need for invasive mechanical ventilation. In present study, duration of oxygen dependency was less in neonates treated with CPAP compared to mechanical ventilation.<sup>11</sup>

De Klerk AM et al, had shown that CPAP treatment in preterm with respiratory distress decreases the duration and invasiveness of respiratory support, thus reducing the hospital stay.<sup>3</sup> T Whitehead et al, and MJ Robinson et al, had shown that early mechanical ventilation in respiratory distress results in increased incidence of barotrauma and lung damage, in turn leading to increased hospital stay.<sup>12,13</sup>

D trevisanuto et al, had shown early CPAP reduces need for mechanical ventilation, chronic lung disease and reduced hospital stay. In present study, duration of hospitalisation was less in neonates treated by CPAP compared to mechanical ventilated neonates. However, it is statistically not significant.<sup>14</sup>

## CONCLUSION

CPAP as a mode of treatment for preterm babies with respiratory distress reduces the duration of oxygen

dependency compared to invasive mechanical ventilation. Difference in duration of hospital stay was statistically not significant in these neonates treated with CPAP and mechanical ventilation.

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