



## Profile of Newborn with Respiratory Distress Syndrome and Outcome in Extramural Deliveries

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### ABSTRACT

**Objective:** To assess the outcome of newborn with respiratory distress syndrome (RDS) in extramural deliveries treated with bubble CPAP and look for risk factors for poor prognosis. On the basis of our findings we wanted to highlight the cost effectiveness of having bubble CPAP in peripheral centres.

**Methods:** This was a prospective analysis study in infants of extramural deliveries admitted to our NICU with respiratory distress. Fisher and Paykel bubble CPAP was applied to all the newborn presenting with respiratory distress since birth, Downe's score =6 and chest Xray shows features of RDS

**Results:** 48 neonates enrolled for the study for the study. On the basis of their arrival time at our unit, neonates were divided in to 2 groups on the basis of early (<12hours) or late(>12hours) initiation of treatment. The criteria for weaning was absence of respiratory distress (minimal or no retractions and respiratory rate <30 and 60 per minute) and SpO<sub>2</sub>>90% on FiO<sub>2</sub> <30% and PEEP <5 cm of water.

**Conclusions:** Infants that were on bubble CPAP within 12 hours of delivery fared significantly better with improvement in Down's score and required shorter period of oxygen exposure.

**Keywords:** respiratory distress syndrome, preterm, outcome, CPAP, extramural deliveries.

### INTRODUCTION

Respiratory distress syndrome (RDS) is the most important cause of morbidity and mortality in preterm infants<sup>[1]</sup>. The treatment of RDS ranges from CPAP to positive pressure ventilation. With the lung injury associated with mechanical ventilation we are now looking at strategies of gentle ventilation. The comparative study by Yadav et al[2] suggest that bubble CPAP (continuous positive airway pressure) is a simple

and effective means of primary respiratory support for management of RDS. Bubble CPAP is also a less expensive method of respiratory support, most suitable to neonatal units with limited resources in developing countries<sup>[3]</sup>. From studies in our country we have seen RDS is common in both term and preterms.<sup>[4,5]</sup> In our country with the introduction of SNCBU in all hospitals as part of Rural Health Mission and increased incidence of preterm births it is time to evaluate whether introduction of bubble

CPAP in more peripheral centres could bring better outcome of RDS. Our study was carried out in a hospital where neonates admitted were delivered outside the hospital and referred with respiratory distress.

## MATERIALS & METHODS

In a prospective observational study we noted the outcome in 48 newborns presenting to our unit with respiratory distress since birth over a period of 12 months (September '11 to August '12), all of them being extramural deliveries. Ethical clearance was obtained from IEC.

On arrival to the unit, details regarding the delivery, resuscitation and treatment since birth were collected from referral hospital in a prescribed format. Consent was taken from caregiver or parent for assisted ventilation. Fisher and Paykel bubble CPAP was applied to all the preterm babies presenting with respiratory distress since birth, Downe's [6] score  $\geq 6$  and chest X-ray shows features of RDS. Severely malformed baby, post extubated baby from ventilator and those babies who were previously given CPAP outside this hospital were excluded.

Bubble CPAP was considered successful if the respiratory distress improves and the neonate can be successfully weaned off from CPAP. The criteria for weaning was absence of respiratory distress (minimal or no retractions and respiratory rate between 30 and 60 per minute) and  $SpO_2 > 90\%$  on  $FiO_2 < 30\%$  and PEEP  $< 5$  cm of water. Infants were diagnosed to have failed CPAP and were started on mechanical ventilation when they remained hypoxic, i.e.  $SpO_2 < 87\%$  with severe retractions despite  $FiO_2 > 70\%$  and PEEP  $> 7$  cm of water or if CPAP is continued beyond a week.

Surfactant was given for babies with moderate or severe RDS on the chest X-ray and/or  $FiO_2$  requirement  $> 30\%$ . Surfactant was administered by INSURE technique (Intubate, Surfactant and Extubate). Based on radiological findings, severity of RDS [7] was graded as mild, moderate or severe.

Data were analyzed using Chi-square test for comparison of proportions and Student's *t*-test to

compare means between two groups. *P* value  $< 0.05$  were considered as significant.

## RESULTS

The 48 newborns who met the selection criteria comprised 63% males and 17% were twin deliveries. 25% were VLBW while 17% were ELBW (Table 1). 71% newborns were successfully weaned off CPAP. Average starting time of CPAP was around 14 hours. It was noted that in 30 children CPAP was initiated within 12 hours of delivery hence they were grouped as early in comparison to the ones in whom the CPAP was initiated after 12 hours due to their delayed presentation at our unit. Data were compared between 2 groups.

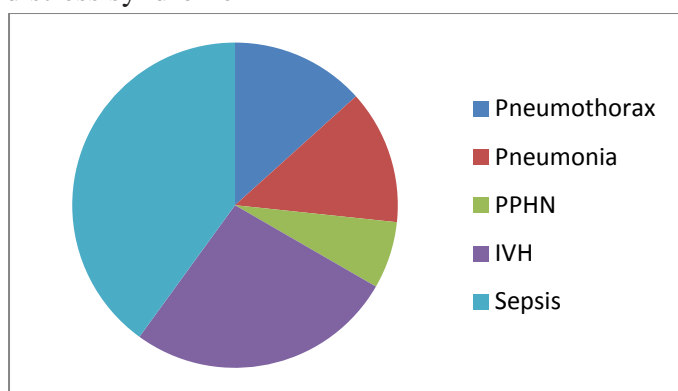
**Table 1:** Characteristics of newborn presenting with respiratory distress syndrome

Characteristics	n = 48 (%)
Males	15(63)
Twins	4(17)
Gestation $\leq 30$ wks	7(29)
Gestation 31-34 wks	8(33)
Gestation $> 34$	9(38)
VLBW (wt $\leq 1500$ g)	6(25)
ELBW (wt $\leq 1000$ g)	4(17)
PROM	8(33)
Cesarean section	11(46)
Antenatal steroids	5(21)
5min apgar	7.59 $\pm$ 1.33
Apnea	5(21)
Downe's score on admission	6.74 $\pm$ 0.92
CXR on admission	
Mild RDS	36(75)
Moderate RDS	4(8.33)
Severe RDS	6(12.5)
Arterial pH	49.68 $\pm$ 10.67
Arterial pCO <sub>2</sub> (mmHg)	7.27 $\pm$ 0.06
Surfactant	28(58.3)
Starting time of CPAP(hrs)	14.33 $\pm$ 11.71
CPAP failure	14(29.17)
Ventilated	8(16.67)
Died	10(20.83)
Complication	12(25)

There were no statistically significant differences in gestational age, gender, use of surfactant, severity of X-ray, initial Downe's score and 'failure' of CPAP in between these 2 groups. But after initial stabilization (after 20 minutes of CPAP therapy) greater improvement in Downe's score (6.6  $\pm$  0.91 to

3.71±1.59) was observed in the early group compared to later group (7±0.93 to 5.29±1.70). It was also possible to wean off CPAP early (mean duration 36±31.6 hours compared to 61.5±38.2 hours) among the ‘successful’ candidates. These were statistically significant (p value <0.05). The oxygen requirement (FiO<sub>2</sub>) reduced significantly in the early group at 20 minutes after initiation of CPAP. 34 babies were successfully weaned off CPAP. The complications are summarised in the figure 1.

**Fig 1:** Complications in newborns with respiratory distress syndrome



**DISCUSSION**

Role of CPAP in preterm and low birth weight infants is well documented [8-11]. Our institution being a tertiary care referral center all the babies were referred from other hospital including remote peripheral area in our state. We note that only 21% of the mothers were given antenatal steroids highlighting the fact that in peripheries the use of antenatal steroids is still not routinely done in preterm deliveries. In spite of poor antenatal steroids, the gradation on X-ray was of mild in majority. The average age of admission and starting of CPAP was 14.33±11.71 hours much delayed compared to similar studies of 5.5 hrs reported in [12]. Another study reported the median age of starting CPAP was 1.7 hrs of life and the median duration of CPAP was 23.5 hrs [13] done among intramural deliveries. In our study the rate of CPAP failure was comparable to previous study of 20-25% in India [12,13] and 24% abroad [14]. Surfactant was not given to all babies due to financial restraints

In the early group there was significant improvement in Downe’s score and lowering of FiO<sub>2</sub> with initiation of CPAP though there was no significant difference in failure rate between the groups as has been stated in [13]. It has been observed that initial improvement of Downe’s score, FiO<sub>2</sub> requirement at 20 minutes were predictors of duration of CPAP therapy as similarly stated in the prospective study done by Koti, et al. [13] A prospective observational study [12] also found statistically significant improvement in Downe’s score after application of early bubble CPAP. Their mean duration of therapy in ‘successful’ group was 30.8±8.6hrs comparable to our early group of 36±31.6 hours.

**Table 2:** Comparison of variables between the early and late CPAP groups

Parameters	CPAP starting time<12hrs (n=30)(%)	CPAP starting time>12hrs (n=18)(%)	P value
<b>Sex M:F</b>	2:1	1.25:1	0.44
Gestational age	32.4±2.99	31.4±3.27	0.28
Birth weight	1.753±0.59	1.749±0.64	0.93
Surfactant	16(53.33)	12(66.67)	0.36
<b>Xray</b>			
Mild	24(80)	12(66.67)	0.29
Moderate	4(13.33)	2(11.11)	
Severe	2(6.67)	4(22.22)	
CPAP failure	8(26.67)	6(33.33)	0.62
Downe’s score before starting of CPAP	6.6 ±0.91	7 ±0.93	0.15
Downe’s score at 20min of CPAP	3.71±1.59	5.29±1.70	0.002
FiO <sub>2</sub> at 20min of CPAP(%)	54.3±9.42	60.6±9.84	0.032
PEEP at 20min of CPAP	5.6±0.74	5.9±0.64	0.16
Total duration of CPAP therapy(among the successful candidates)	36±31.6 (n=22) (Range 5.5 to 102 hrs)	61.5±38.2 (n=12) (Range 20 to 137 hrs)	0.045

**CONCLUSION**

We emphasize regular use of antenatal steroids in preterm deliveries. There should be earlier intervention with CPAP in RDS patients or earlier

referral if there is no facility of bubble CPAP in the referring hospital.

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#### REFERENCES

- Greenough A, Milner AD, Dimitriou G. Synchronized mechanical ventilation for respiratory support in newborn infants. Cochrane Database of Systemic Reviews 2002, Issue 1. [DOI:10.1002/14651858.CD000456.pub2]
- Yadav S, Thukral A, Sankar MJ, Sreenivas V, Deorari AK, Paul VK, Agarwal R Bubble vs conventional continuous positive airway pressure for prevention of extubation failure in preterm very low birth weight infants: a pilot study. Indian J Pediatr. 2012 Sep;79(9):1163-8. doi: 10.1007/s12098-011-0651-2. Epub 2011 Dec 23.
- Lanieta K, Joseph K, Josaia D, Samantha C, Trevor D. An evaluation of bubble-CPAP in a neonatal unit in a developing country: effective respiratory support that can be applied by nurses. J Trop Pediatr 2006; 52: 249-253.
- Ayachi A, Rigourd V, Kieffer F, Dommergues MA, Voyer M et al. (2005) Hyaline membrane disease in full-term neonates. Arch Pediatr 12: 156-159.
- Bouziri A, Ben Slima S, Hamdi A, Menif K, Belhadj S et al. (2007) Acute respiratory distress syndrome in infants at term and near term about 23 cases. TunisMed 85: 874-879.
- Carlos JS. Diagnostic imaging. In: Martin RJ, Fanaroff AA, Michele CW, editors. Neonatal- Perinatal Medicine: Diseases of the Fetus and Infant. 8th ed. Philadelphia: Mosby Elsevier Publishers; 2006. p. 713-714.
- Downes JJ, Vidyasagar D, et al. Respiratory distress syndrome of newborn infants. Clin Pediatrics. 1970; 9: 325-331.
- Subramaniam P, Henderson-Smart DJ, Davis PG. Prophylactic nasal continuous positive airways pressure for preventing morbidity and mortality in very preterm infants. Cochrane Database System Rev 2005; 3: CD001243
- De Klerk AM, De Klerk RK. Nasal continuous positive airway pressure and outcomes of preterm infants. J Paediatr Child Health 2001; 37: 161-167.
- Ho JJ, Subramaniam P, Henderson-Smart DJ, Davis PG. Continuous distending pressure for respiratory distress syndrome in preterm infants. Cochrane Database System Rev 2002; 2: CD002271.
- Narendran V, Donovan EF, Hoath SB, Akinbi HT, Steichen JJ, Jobe AH. Early bubble CPAP and outcomes in ELBW preterm infants. J Perinatol 2003; 23: 195-199.
- Prashanth S Urs, Firdose Khan And PP Maiya Bubble CPAP - A Primary Respiratory Support for Respiratory Distress Syndrome in Newborns, Indian Pediatrics Volume 2009; 46 : p.409-411
- 13.Jagdish Koti, Srinivas Murki, Pramod Gaddam, Anupama Reddy And M Dasaradha Rami Reddy Indian Pediatrics 2010 ; 47:p.139-143.
- 14.Ammari A, Suri M, Milisavljevic V, Sahni R, Bateman D, Sanocka U, et al. Variables associated with the early failure of nasal CPAP in very low birth weight infants. J Pediatr 2005; 147: 341-347.