



## ROLE OF BUBBLE CONTINUOUS POSITIVE AIRWAY PRESSURE AND ITS EFFICACY IN MANAGEMENT OF NEONATES WITH RESPIRATORY DISTRESS IN A TERTIARY CARE HOSPITAL

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### ABSTRACT

**INTRODUCTION:** Respiratory distress is the most important cause of morbidity and mortality in neonatal period. The most common causes of respiratory distress in newborn are respiratory distress syndrome, apnea of prematurity, transient tachypnea of newborn, meconium aspiration syndrome and sepsis.

**AIMS & OBJECTIVES:** This study is done to find out effectiveness of bubble CPAP in neonates with respiratory distress and also to find out CPAP failure rates.

To observe survival of newborn neonates with respiratory distress treated with bubble CPAP in tertiary care Centre.

**MATERIAL & METHODS:** Prospective study was done from July/2018 to November/2018 on 54(n) newborn babies requiring respiratory support for mild to moderate respiratory distress according to silverman scoring. Support was given with bubble CPAP in combination with surfactant whenever required via INSURE (intubation, surfactant, extubation) protocol.

**RESULTS:** Out of 54(n) neonates studied, 73.3% (n=39) were preterm babies and 27.7%(n=15) were term babies requiring respiratory support in the form of bubble CPAP. Most common cause of respiratory distress in preterm babies is RDS (41%), Apnea of prematurity in the second order with 23% of cases in our study. In term babies both TTN & MAS (meconium aspiration syndrome) comprising of 33.33% were common causes. Bubble CPAP failure rate was seen in 14.8% of cases out of which 87.5% cases were preterm neonates. Main complications were skin abrasions (51.8%), feed intolerance (37%), secondary infection (31.4%). survival rate was 96.2%.

**CONCLUSION:** Bubble continuous positive pressure (CPAP) is safe, efficacious and easy to use in both term and preterm babies with mild to moderate respiratory distress. CPAP Failure is significantly associated with babies who did not receive antenatal steroids, presence of significant sepsis and silverman score more than 7 at admission.

**KEYWORDS :** CPAP, RDS, MAS, AOP.

### INTRODUCTION

Respiratory distress is the most common cause of morbidity and mortality in new born babies<sup>1,2</sup>. The most common causes of respiratory distress in newborns are RDS, AOP, MAS, TTN, SEPSIS and PNEUMONIA<sup>1,2</sup>.

Intermittent positive pressure ventilation with surfactant therapy was standard treatment in RDS<sup>1</sup>.

Continuous positive pressure refers of application of continuous distending pressure in a spontaneously breathing neonate, increases functional residual capacity of lung, resulting in better gaseous exchange<sup>2</sup>.

Bubble CPAP differs from conventional CPAP in that b-CPAP, the expiratory limb is placed underwater and oscillatory vibrations are transmitted into chest resulting wave forms similar to those produced in high frequency ventilation<sup>3-5</sup>

The major difficulty with IPPV is that it is invasive, results in lung injury with increased risk of ventilator associated pneumonia and chronic lung disease<sup>2</sup>.

### AIMS & OBJECTIVES

- To find out effectiveness of bubble CPAP in newborn neonates with respiratory distress & to find out CPAP failure rates.
- To observe survival of newborn neonates with respiratory distress treated with bubble CPAP.

### MATERIALS AND METHODS

Prospective observational study was done on newborn neonates with respiratory distress who were admitted in GSL medical college for the time period July/2018 to November/2018. All consecutively born preterm neonates with gestational age between 27 weeks to 40 weeks admitted with respiratory distress were included in this study. Eligible infants were started on b-CPAP with bi-nasal prongs. Positive end-expiratory pressure (PEEP) was started at 5 cm of H<sub>2</sub>O

and was adjusted to minimized chest retraction. FiO<sub>2</sub> was adjusted to maintain SpO<sub>2</sub> 88% to 94%. Flow was titrated to produce continuous bubbling in the chamber. Surfactant (bovine derivative) was administered via intubation, surfactant replacement, extubation (INSURE) protocol. b-CPAP was considered to be successful if neonate is clinically stable, respiratory distress improved and the baby could be successfully weaned off from b-CPAP. Preterm infants with no subcostal recession, no nasal flaring, the respiratory rate between 50 per min and 60 per min and O<sub>2</sub> saturations of >90% on FiO<sub>2</sub> <30% and PEEP <5 cm of water were weaned off from b-CPAP.

Total numbers of 54 neonates were studied. All newborns with signs and symptoms of respiratory distress, with Silverman score of 3-7 within 24hrs of life and with recurrent episodes of apnea >2 in 12hrs were included in the study. Newborns with bodyweight less than 1kg, gestational age <32 weeks, respiratory distress due to cardiac causes, babies with congenital anomalies and with septic shock were excluded from the study.

If requirement of PEEP is >8cm of H<sub>2</sub>O, FiO<sub>2</sub> more than 70%, occurrence of recurrent apnea on b-CPAP despite caffeine citrate and saturation falling below 88% even with high settings was considered as CPAP failure and further management was done with mechanical ventilation.

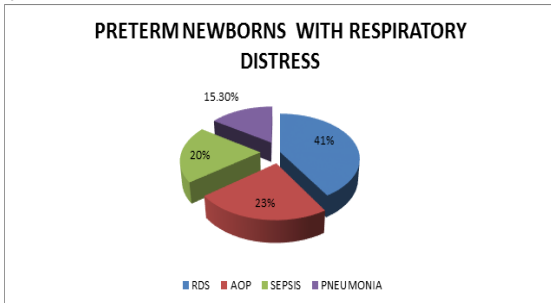
During the course of study Neonates were monitored continuously by using Routine blood investigations, CXR were done, CXR was repeated as and when required and ABGs were done infrequently but appropriate workup was done where ever required.

At a point when if neonate who failed to maintain SpO<sub>2</sub> with PEEP 5cm H<sub>2</sub>O and FiO<sub>2</sub> of 50% were advocated surfactant therapy and were put back again on CPAP (INSURE technique).

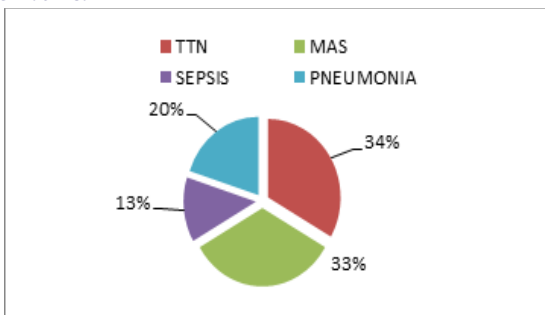
Supportive management was given as per standard protocols.

**RESULTS:**

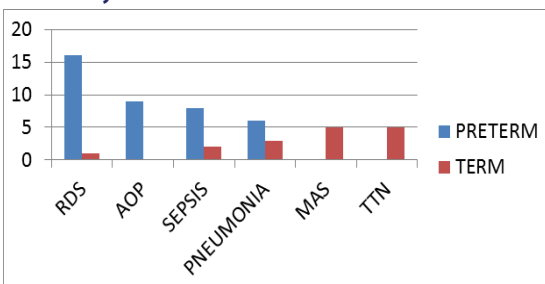
A total of 54 newborns were studied in this study out of which 27.7% (n=15) were term and remaining are preterm babies 72.3% among preterm babies it was identified that RDS accounts for 41%, followed by AOP with 23%, sepsis (20%), pneumonia (15.3%). Among term babies studied in this study majority of cases were TTN (33.3%), and MAS (33.3%), and the remaining were pneumonia (20%), sepsis(13.3%).



**Graph 1: incidence of RDS, AOP, Sepsis, Pneumonia in preterm newborns.**



**Graph 2: causes of respiratory distress in term newborns in present study.**



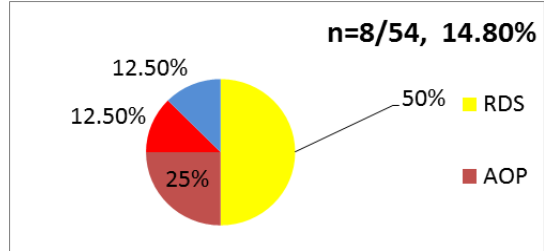
**Graph 3: comparison of principle causes of respiratory distress in term and preterm infants.**

The mean duration on cpap was highest for newborns with AOP( 79.2) followed by pneumonia ,RDS,sepsis ,MAS,TTN,accounting 76.8hrs,73.2%,67.2%,57.6%,24.8% respectively.

**Table 1: mean duration of REQUIREMENT OF CPAP**

RESPIRATORY DISTRESS	MEAN DURATION OF BUBBLE CPAP
RDS	73.2 HRS
SEPSIS	67.2 HRS
PNEUMONIA	76.8HRS
AOP	79.2HRS
TTN	24.8HRS
MAS	57.6HRS

It was observed that total of 14.8%(n=8/54) of cases found not improved, and considered as CPAP failure cases, and it was observed that most of the cases were RDS (50%), and the remaining were AOP, sepsis ,MAS 25%,12.5%,12.5% respectively Skin and septal abrasions 51.8%, feed intolerance 37%, secondary infection 31.4%, coumella necrosis 10% were the complications observed.



**TABLE 2: COMPLICATIONS OF BUBBLE CPAP**

SKIN AND SEPTAL ABRASIONS	51.8%
FEED INTOLARANCE	37%
SECONDARY INFECTION	31.4%
COLUMELLA NECROSIS	10%

- It was observed that the preterm babies who received antenatal steroids had early recovery on CPAP and less chances of RDS in this study.
- INSURE technique was required in 24% of cases.
- Survival rate was 96.2%.

**DISCUSSION**

We have evaluated effectiveness of b-CPAP in management of newborn with respiratory distress in both term and pre term babies. The role of b-CPAP in management of respiratory distress in preterm babies was emphasized by many researchers but studies on term babies were lacking.

Out of 54 cases, who were connected to b-CPAP with signs and symptoms of respiratory distress 85.2% were considered successful treatment which is higher than that founded by shamil et al(66%)<sup>6</sup>.

Success was higher in patients who received antenatal steroids (ANS), however no significances was found for antenatal steroid (p-Value=0.238) in our study which was unlike to that findings in URS, et al<sup>8</sup>. (p-Value=0.001) and found a 38% failed CPAP and required ventilator support, which was higher than that found in our study (14.8%).

Retrospective analytic study done by KOTI, et al.,<sup>9</sup> on 56 neonate (28-34 weeks); only 14 (25%) cases were considered as CPAP failure which is significantly more than our study i.e. 8/54(14.8%), this difference was explained by the mean gestational age of newborns, and their birth weights, time taken to start on CPAP and the type of CPAP and their circuits, type of nasal interface, age of starting CPAP and use of antenatal steroids and surfactant.

In our study we found that the age of neonate at which CPAP had been applied median = 1hr (0.3-4) hours of life is a significant contributor for the CPAP success (P=0.04) which is different from that found by Koti et al<sup>7</sup> (P value=0.58). Although septicemia and apnea predicted CPAP failure in our study too, pneumothorax was not seen in present study because if pressures requiring more than 7 were considered and labeled as CPAP failure and connected to ventilator.

The most common cause of respiratory distress in neonate is RDS; this was also the case 50% in our study.

The first randomized controlled trial of surfactant administration while the neonate requirement of subsequent mechanical ventilation was reduced in those cases with moderate to severe respiratory distress<sup>7</sup>.

If surfactant administration was early in the course there was drastic improvement in respiratory distress in our study. Indian studies on CPAP have shown a failure rate of 25-50, in our study 8 cases failed CPAP of which 4 were RDS cases.

It was observed that there is early normalization of arterial blood gases, which was comparable to other studies. In a landmark study (COIN Study) Morley et al.,<sup>11</sup> States that primary nasal CPAP

considerably decreased the requirement for intubation but not significantly lessen the mortality rates or chronic lung disease, as compared with mechanical ventilation. Neonates treated with b-CPAP were more successful and need of mechanical ventilation could be minimized.

In our study babies with mild to moderate respiratory distress started on b-CPAP as early as possible when the signs of respiratory distress was evident, 39/54 were preterm and the rest were term babies and the complications of CPAP were more in preterm babies compared to term babies.

Results of our study showed that babies who did not receive antenatal steroids at least before 48 hrs, had long duration on CPAP and associated with higher chance of failure rates.

Complications associated with CPAP can be minimized by good nursing care, especially abrasions and septal trauma.

Main limitation of our study was it is single Centre based study so results can't be generalized.

#### **CONCLUSION:**

BUBBLE CPAP is safe, efficacious and easy to use in both term and preterm babies with mild to moderate respiratory distress.

CPAP failure is significantly associated with babies who did not receive antenatal steroids, presence of significant sepsis and Silverman score more than 6.

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