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A STUDY OF THE CLINICAL PROFILE AND OUTCOME OF NEWBORNS WITH RESPIRATORY DISTRESS WHO RECEIVED NON-INVASIVE VENTILATION WITH BUBBLE CONTINUOUS POSITIVE AIRWAY PRESSURE IN A TERTIARY CARE CENTER

Paediatrics

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ABSTRACT

Background: Respiratory distress is one of the commonest conditions in newborns requiring NICU admission especially among those less than 34 weeks of gestational age. Intervention of this with the timely Bubble CPAP support can significantly decrease neonatal mortality and morbidity. Objectives of the study: To study the clinical profile and outcome of non-invasive ventilation using bubble continuous positive airway pressure (CPAP) in newborns with respiratory distress in a tertiary care center. **Methodology:** A prospective observational study was conducted among the first 100 newborns admitted in NICU with respiratory distress between January 2022 to December 2022. Downes score was used to assess the respiratory distress at the time of admission. **Results:** 81.5% of the babies showed improvement with Bubble CPAP and were weaned to oxygen hood and 18.5% babies required mechanical ventilation. Earlier application of Bubble CPAP showed good outcome. Neonates between 32 to 36 weeks were highly benefitted with usage of Bubble CPAP. There was a statistical significance with usage of antenatal steroids and the outcome of the neonates. Conclusion: Bubble CPAP is one of the best modes of treatment in newborns with respiratory distress. Application of Bubble CPAP can be set up by nursing staff with minimal training. Downes score helped in subsequent clinical assessment of distress. Also, has very minimal complications while using Bubble CPAP.

KEYWORDS

Downes score, CPAP, NICU, Respiratory distress, Newborn

INTRODUCTION

Neonatal mortality rate is the major indicators for the health status of the nation. In developed countries, the neonatal mortality rates are 3–5 per 1000 live births respectively[1,2] . In India, despite remarkable progress in urban areas neonatal mortality rates are still high. The current neonatal mortality rate (NMR) of India is 30.92 per 1000 live births Many studies reveal that nearly half (32-52%) of this is due to respiratory distress in neonatal period. Respiratory distress is one of the commonest problems of neonates occurring throughout the world (3-7% of all live births) [3-6]. Non-invasive ventilation is one of the important methods in the management of newborns with respiratory distress.

AIMS AND OBJECTIVES

To study the clinical profile and outcome of non-invasive ventilation using bubble continuous positive airway pressure in newborns with respiratory distress in a rural tertiary care center.

MATERIALS AND METHODS

A prospective study was undertaken at GEMS hospital between January-2022 to December 2022 after obtaining clearance from the Hospital Ethical Committee. In the study group, 100 neonates with respiratory distress treated with CPAP were divided into 2 groups based on the outcome.

INCLUSION CRITERIA:

- Newborns with respiratory distress [DOWNE'S SCORE 4 to 6].
- Newborns with SpO2 < 85% even with supplemental oxygen.

EXCLUSION CRITERIA:

- Newborns with severe respiratory distress [DOWNES SCORE>7/10].
- Newborns with congenital cardiac disease.
- Refractory seizures.

RESULTS AND OBSERVATIONS

In this prospective observational study, out of 100 newborns with respiratory distress, 70% newborns were diagnosed to have respiratory distress syndrome and 16% newborns were admitted in view of birth asphyxia and 12% babies were diagnosed to have MAS and other causes constitute 2%. There was an increase in outcome among these who required a bubble CPAP support, and it was statistically significant (<0.001).

TABLE – 1
Diagnosis vs outcome

DIAGNOSIS	OUTCOME		TOTAL
	SURVIVED	MV	
RDS	53 (76%)	17 (24%)	70 (100%)
ASPHYXIA	15 (97%)	1 (3%)	16 (100%)
MAS	11 (96%)	1 (4%)	12 (100%)
OTHERS	2 (100%)	0 ((0%)	2 (100%)
TOTAL	81 (79%)	19 (21%)	100 (100%)
p value	0.001		

FIGURE – 1

Bar diagram showing the distribution of respiratory distress in newborns who survived and mechanical ventilator.

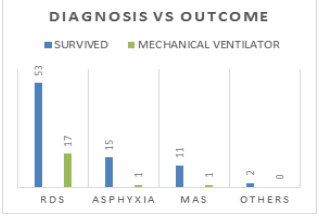


TABLE – 2 Downes score vs Outcome.

OUTCOME	n = 100	DOWNES SCORE	
		MEAN	SD
SURVIVED	81	4.7	0.61
MECHANICAL VENTILATOR	19	5.79	0.32
p value	< 0.001		

FIGURE - 2

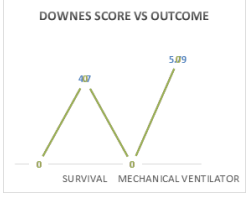


TABLE – 3 DURATION OF CPAP vs OUTCOME

CPAP DURATION	OUTCOME		TOTAL
	SURVIVED	MV	

< 6 HOURS	3 (75%)	1 (25%)	4 (100%)
6-12 HOURS	7 (87.5%)	1 (12.5%)	8 (100%)
12-24 HOURS	22 (95.9%)	1 (4.1%)	23 (100%)
> 24 HOURS	50 (76%)	15 (24%)	65 (100%)
TOTAL	82	18	
p value	0.001		

FIGURE – 3 Bar diagram showing the duration of CPAP and outcome.

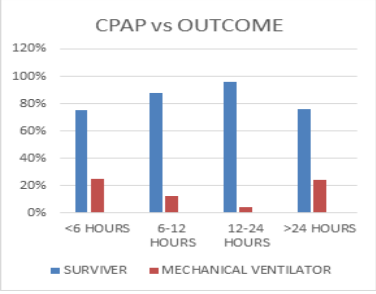


TABLE – 4 Antenatal steroids vs Outcome

ANTENATAL STEROIDS	OUTCOME	
	SURVIVED	MV
NOT GIVEN (25)	21(82%)	4 (18%)
INCOMPLETE (30)	20(66%)	10 (34%)
COMPLETE (45)	41(91%)	4(9%)
TOTAL	82(81%)	18 (19%)
p value	<0.001	

FIGURE – 4

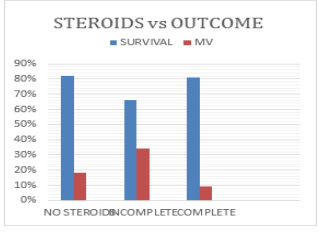
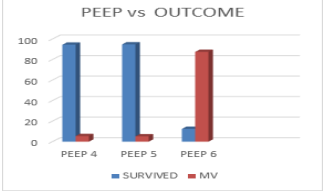


TABLE – 5 PEEP vs Outcome

PEEP	OUTCOME	TOTAL	
	SURVIVED	MV	
4	17 (94.5%)	1 (5.5%)	18(100%)
5	55 (94.8%)	3 (5.17%)	58 (100%)
6	3 (12.5%)	21 (87.5%)	24 (100%)
TOTAL	75 (75%)	25 (25%)	100 (100%)
p value	<0.001		

FIGURE – 5 Bar diagram showing the distribution of PEEP and outcome.



DISCUSSION

Non-invasive CPAP is very effective and user-friendly device to rescue newborns who have respiratory distress due to various etiology. Comparatively BUBBLE CPAP is very easy to assemble and need minimal training for execution. In this study 100 newborns with respiratory distress were analyzed for the outcome of CPAP. Different causes of respiratory distress were diagnosed including Respiratory Distress Syndrome, Meconium Aspiration Syndrome, Birth Asphyxia, and others (congenital pneumonia, congenital air way disease, etc.).

DOWNES SCORE

Routinely used scores in clinical assessment of respiratory distress in newborns are Downes Score and Silverman Anderson Score. In this study Downes score was used to analyze severity. A Downes score between 3-6 was considered as an indication for bubble CPAP while a score of more than 7 was taken as a sign of Impending Respiratory Failure requiring Mechanical Ventilation. Most of the newborns with a score of 4 and 5 had a significant outcome with CPAP. A study on Downes score for assessment of respiratory distress in preterm neonates by Shashidhar A,Suman Rao PN, Joe Jose showed that inter rater variability was better in Downes score and can be widely used for respiratory distress assessment[6].

PEEP REQUIREMENT

Neonates who required a PEEP of 4 and 5 survived well with the usage of CPAP. Those whose required a PEEP of 6 required a longer duration of CPAP.

Ewa Gulczynska et al., conducted a prospective observational multicenter study on PEEP as a predictor of CPAP failure showed that, increased PEEP requirement can used to predict the need for mechanical ventilation [7].

BUBBLE CPAP DURATION

Bubble CPAP duration was highly dependent on maturity of the baby, birth weight, and the course of Antenatal steroids. Late Preterm and Term babies required bubble CPAP for a duration of less than 24 hours and survived well. Out of 65 newborns who required CPAP for more than 24 hours 76% newborns survived well while 24% newborns went in for CPAP FAILURE. Nicolas Bamat, Erik A. Jensen, and Haresh Kirpalani., conducted a study about Duration of continuous positive airway pressure in premature infants showed that newborns with lesser gestational age required longer duration of CPAP[8].

ANTENATAL STEROIDS

Corticosteroids played a vital role in the lung maturity of the neonates that reflected as the improvement of respiratory distress. Newborns who received a full course of antenatal steroids showed a better outcome with CPAP. Newborns received incomplete steroid course also showed a better survival. So even a single steroid dose was found to be very much useful in the neonatal outcome. Requirement of mechanical ventilation was there among the newborns who did not receiving even, a single dose of steroid.

Vivek Arora, Sandip G Gediya, Rupali Jain et al., conducted a study on outcome of premature babies with RDS using bubble CPAP by [9], it showed 30.5% of CPAP failure in newborns who had not been exposed or who had been partially exposed to Antenatal Steroids. In this study 81.5% of newborns who received complete course of steroids showed good outcome and 17.6% of newborns who did not receive antenatal steroids had CPAP failure.

CONCLUSION

From this study it is concluded that - Bubble CPAP is one of the best methods of management in newborns with respiratory distress. Newborns with Respiratory Distress Syndrome recovered more with usage of non-invasive ventilation like Bubble CPAP. This can require a minimal trained nursing staff for setting up. Downes score can be used to monitor the improvement during CPAP treatment. Antenatal steroids played a vital role in the better outcome of preterm babies with immature lung function and thereby the outcome with bubble CPAP.

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