

Efficacy of indigenous bubble CPAP in treating respiratory distress of newborn

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Abstract

Background: Respiratory illness remains one of the most common causes of neonatal death in the developing world. The respiratory support during distress is provided to neonates using either mechanical ventilation or Continuous Positive Airway Pressure (CPAP). **Aim and Objectives:** To study the efficacy of indigenous bubble CPAP in treating respiratory distress among newborns also, to study the variation in outcome of BCPAP with changing gestational age. **Material and Methods:** It's a prospective, observational type of study conducted on the babies requiring BCPAP at the time or during the hospital stay over a period of 2 years. The final outcome in terms of success and failure evaluated and also studied with reference to gestational ages. **Results:** Out of 1571 patients, a total of 748 (47.61%) required BCPAP. There were 452 males with 276 (61.06%) managed successfully with a poor outcome among males compared to females (77.03%). There is an increase in chance of success regarding outcome of BCPAP as the gestational age increases. Out of 748 babies kept on BCPAP, 244 (32.6%) failed and remaining 504 (67.4%) were showed favourable results with BCPAP. **Summary and Conclusions:** BCPAP is increasingly used as a first choice for ventilator support in tertiary centres. It reduces morbidity and mortality, as well as the need for mechanical ventilation. It can be administered by trained nurses and is safer than mechanical ventilation.

Key Words: Respiratory distress, BCPAP.

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INTRODUCTION

Respiratory distress is most common and serious complication of preterm birth, neonatal pneumonia, and neonatal sepsis, which together account for over one-half of all neonatal deaths globally. More than 50% of babies born at ≤ 31 weeks of gestation will develop respiratory distress syndrome (RDS). Respiratory distress is associated with over 80% of cases of neonatal pneumonia and most cases of neonatal sepsis.¹ In the developed world, respiratory support is provided to neonates using either mechanical ventilation or

Continuous Positive Airway Pressure (CPAP). Unfortunately, ventilators and CPAP machines are too expensive and technically complex for many resource-limited settings. As a result, respiratory illness remains one of the most common causes of neonatal death in the developing world. India is home of 20% of global birth and to highest number of neonatal deaths in the world. Each year nearly 27 million infants are born in India of these 1.2 million die during neonatal period. CPAP is a gentle and effective tool to treat even preterm and low birth weight infants in respiratory distress. Well-resourced hospitals use ventilators, stand-alone CPAP devices, or tubing, wall air and oxygen to set up CPAP at the bedside. Bubble CPAP has been used in developed countries for decades. In bubble CPAP (BCPAP), pressure is safely regulated which helps to recruit alveoli and increase functional residual lung capacity, thus lowering the baby's work of breathing.²

MATERIAL AND METHODS

The present study is a prospective, observational type of study. The study population included the babies requiring BCPAP at the time or during the hospital stay over a

period of 2 years. The indigenous bubble CPAP assembled in the NICU using intercostal drainage bag, t piece connector, nasal prongs and oxygen source with humidifier.³ All the babies meeting the inclusion criteria are kept on BCPAP and monitored. The final outcome in terms of success and failure are evaluated, as well as complications and reasons for failure were studied. The pressure of BCPAP is regulated by adding or removing the water from intercostal drainage bag. Once the score is less than 4 the babies are shifted to oxygen without CPAP. The study design and methodology of the present study was approved by the institutional ethical committee. The neonatal admissions consisting of all inborn neonates born in the tertiary care centre with the respiratory distress at the time of admission were included in the study. While, all those out born neonates, inborn patients with respiratory distress not fitting into criteria to start BCPAP, patients with severe distress needing endotracheal intubation at the start and those babies who required surfactant were excluded from the study.

RESULTS AND OBSERVATIONS

Out of 1571 patients studied during a period of two years, a total of 748(47.61%) required BCPAP while, 233 (14.83%) patients doesn't required any CPAP.

Table 1: Pattern of use of BCPAP in newborns with respiratory distress

Characteristics	No. of cases	%
Total admissions(in 2 yrs) with no distress	590	37.56
No of babies with distress not requiring CPAP	233	14.83
No of babies on BCPAP	748	47.61
Total	1571	100.00

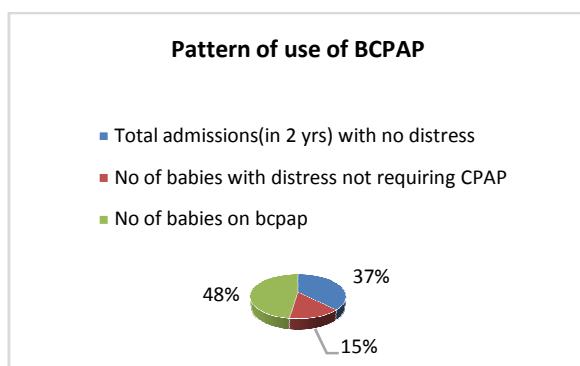


Figure 1:

Table 2: Gender-wise outcome of BCPAP among newborns

Characteristic	Outcome		Total
	Success	Failure	
Gender	Female	228 (77.03%)	68 (22.97%)

Male	276 (61.06%)	176 (38.94%)	452
Total	504	244	748

Chi Square test = 1.72; p<0.05; HS

Above Table No.02 shows outcome of BCPAP with respect to gender. There were 452 males included in the study out of which 276 were successfully managed while, out of 296 females, 228 were managed successfully. Poor outcome is seen with male patients and this difference was found to be statistically significant.

Table 3: Gestational age wise outcome of BCPAP among newborns

Gestational Age (wks)	Outcome		Total
	Success (%)	Failure (%)	
<28	0(0%)	7(100%)	7
28-30	11(28.9%)	27(71.05%)	38
30-32	90(62.93%)	53(37.06%)	143
32-34	133(71.12%)	54(28.87%)	187
34-36	118(73.29%)	43(26.70%)	161
36-38	73(75.25%)	24(24.74%)	97
38-40	47(62.66%)	28(37.33%)	75
>40	32(80%)	8(20%)	40
Total	504	244	748

Chi Square test = 46.16; p<0.001; HS

Table no. 03 shows outcome of BCPAP in relation to the gestational age. This table shows that, there is increase in chance of success of outcome of BCPAP as the gestational age increases. Lower gestational age is having lowest success rate.

Table 4: Efficacy of indigenous BCPAP

Outcome of Bubble CPAP	Number of newborns	Percentages
Success	504	67.40%
Failure	244	32.60%
Total	748	100.00%

Chi Square test = 117.94; p<0.001; HS

The above Table shows the efficacy of indigenous BCPAP in babies with respiratory distress. Out of 748 babies kept on BCPAP, 244 (32.6%) failed and those who required intubation were 504 (67.4%) were successfully managed.



Figure 2:

DISCUSSION

Table 1 shows that, during the study period of two years 1571 babies were admitted in the inborn section of NICU,

out of which, 981 (62.44%) babies were having some degree of respiratory distress, out of which 748 (47.61%) were kept on bubble BCPAP and were included in the study. 233 (14.83%) babies with severe respiratory distress needed intubation at time of admission and were not included in study. Comparing with other studies we get study by Zaazou MH *et al*⁴ mentions 19% babies needed BCPAP. Other study by Mathur NB⁵ in his study mentioned 29.2% babies requiring BCPAP. Were as study by Buckmaster *et al*⁶ in his study mentioned 50% incidence of respiratory distress requiring BCPAP. Table 3 shows the outcome of BCPAP with respect to gestational age. Failure rates decreases as the gestational age increases with high failure rates in lower gestational ages and failure decreases as the gestational age increase. Dargaville *et al*⁷ shows similar result with greater failure rates in lower gestational age. Urs PS *et al*⁸ mentioned gestational age as predictor of failure of BCPAP with lower failure rates with advanced gestational age. In multicentric randomized control trial Bober k *et al*⁹ also concluded lower gestational age major risk factor of failure of BCPAP. In our study, from table 04 its clear that, out of 748 kept on BCPAP, 244 were failed and were shifted to ventilator, thus the success rate was 67.37% and failure rate was 32.6%. Other studies from various centers showed variation in failure rate. Ammari A *et al*¹⁰, reported failure rate of 5%, Boo NY *et al*¹¹ reported failure rate of 37% in NICU respectively. Other studies from Urs PS *et al*⁸, reported failure rate of 20% and Koti J *et al*¹² reported failure rate of 25% respectively. BCPAP is very effective in managing newborns with respiratory distress in poor resource setups.

SUMMARY AND CONCLUSIONS

The study shows lower success rate among male patients. Highest admission were in 34-36 gestational age, lower gestational ages were associated with lower success rate. Indigenous BCPAP is now-a-days considered as a first line therapy for management of respiratory distress in newborn. Currently, the use of CPAP is increasing due to the advantage of being less expensive, less damaging and having reduced incidence of the chronic lung disease and broncho-pulmonary dysplasia over the use of invasive mechanical ventilation. It is an extension of ventilator support rather than replacement of mechanical ventilation. Use of indigenous BCPAP in low resource setups availability is boon to the current management of

newborns with respiratory distress. Its use in non-tertiary settings can cause less referrals and can save lives of many newborns. It is to be emphasized that indigenous BCPAP is a hope in many low-resource settings, were patients are not affordable to take sophisticated treatments like surfactant due lack of expertise or lack of facility.

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